HEATHKIT® MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

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Credit ..... (616) 982-3561
Replacement Parts ..... (616) 982-3571
Technical Assistance:
R/C, Audio, and Electronic Organs ..... (616) 982-3310
Amateur Radio ..... (616) 982-3296
Test Equipment, Strobe Lights, Calculators,
Clocks, Weather Instruments ..... (616) 982-3315
Television ..... (616) 982-3307
Automotive, Marine, Appliances,
Security, General Products ..... (616) 982-3496

YOUR HEATHKIT 90-DAY FULL WARRANTY

If you are not satisfied with our service - warranty or otherwise - or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

Our attorney, who happens to be quite a kitbuilder himself, insists that we describe our warranty using all the necessary legal phrases in order to comply with the new warranty regulations. Fine. Here they are:

For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, any Heathkit Electronic Center (units of Schlumberger Products Corporation), or any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty does not cover and we are not responsible for damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, or by unauthorized modifications to or uses of our products for purposes other than as advertised. Our warranty does not include reimbursement for customer assembly or set-up time.

This warranty covers only Heathkit products and is not extended to allied equipment or components used in conjunction with our products. **We are not responsible for incidental or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HEATH COMPANY
BENTON HARBOR, MI. 49022

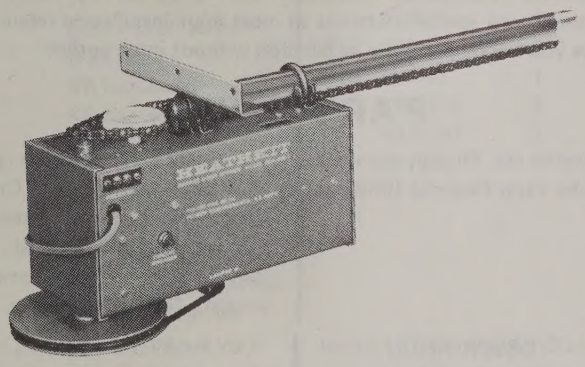
Prices and specifications subject to change without notice.

Price $2.00

ASSEMBLY

Model GDA-309-1
GARAGE DOOR
OPERATOR MECHANISM

595-1303-06



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HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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INTRODUCTION

The Heathkit Garage Door Operator Mechanism Model GDA-309-1 is a sturdy and dependable device which will open and close all types of overhead residential garage doors that do not exceed 8 feet in height. When used with the optional Heathkit Garage Door Transmitter and Receiver, you will no longer have to leave the comfort of your car to operate the garage door. Just press the button on the "wireless" transmitter and your garage door will open or close. This is especially convenient during bad weather or when it is late at night.

The Mechanism not only opens and closes your garage door, but also locks it. Once closed, your garage door cannot be opened by hand from outside the garage. Should a power failure occur, the quick-release pin can easily be removed from inside your garage, permitting the door to be opened by hand.

A unique safety-switch feature returns the door to its fully opened position if it becomes obstructed while closing. Other features include circuit overload protection and a safety light.

The Heathkit Garage Door Operator Mechanism has been designed to provide many years of trouble-free operation. Its features will not only save time and steps, but will also enhance the value of your home.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, and step-by-step assembly procedures.

NOTE: It is suggested that, before you begin to assemble the Garage Door Operator Mechanism, you read the "Installation" section of the Manual on Page 18. This will allow you to determine and obtain any special materials to meet your installation requirements ahead of time. This will allow you to complete the installation without interruption.

PARTS LIST

Check each part against the following list. The key numbers correspond to the numbers on the Parts Pictorial (fold-out from Page 3).

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with the kit. If one is not available, see "Replacement Parts" inside the rear cover of this Manual. Your Warranty is located inside the front cover. For pricing information, refer to the separate "Heath Parts Price List."

KEY No.	HEATH No.	PARTS Per Kit	DESCRIPTION
TRANSFORMER-SWITCHES-CIRCUIT BREAKER-RELAY			
A1	54-263	1	Power transformer
A2	64-12	1	Pushbutton switch
A3	65-39	3	Microswitch
A4	65-38	1	Circuit breaker
A5	69-64	1	Relay
STRAIN RELIEF-LINE CORD-WIRE			
A6	75-71	1	Line cord strain relief
	89-23	1	3-wire line cord
	344-2	1	Black wire
	344-3	1	Red wire
	344-29	1	Blue wire
	347-16	1	Length 2-conductor twisted cable

KEY No.	HEATH No.	PARTS Per Kit	DESCRIPTION
METAL PARTS			
B1	90-515-2	1	Chassis cover
B2	200-619-2	1	Chassis
B3	100-589	1	Capacitor mounting strap
B4	100-1042	1	Drive sprocket assembly
B5	204-1155	1	Door mounting bracket
B6	204-1177	1	Rear beam bracket
B7	204-1176	1	Front beam bracket
B8	204-1178	1	Lamp mounting bracket
B9	204-1191	2	Switch mounting bracket
B10	207-75	3	Beam clamp
B11	216-42	2	Straight arm bar
B12	266-203	1	Curved arm bar
B13	266-207	3	32" long beam
B14	266-208	1	28" long beam
B15	266-209	1	Idler arm
B16	266-210	2	Switch operator
B17	266-211	1	Trolley assembly

HARDWARE

NOTE: The hardware is shown full size on the Parts Pictorial for your convenience.

#6 Hardware

KEY No.	HEATH No.	PARTS Per Kit	DESCRIPTION
C1	250-365	4	#6 x 1/4" sheet metal screw
C2	250-89	10	6-32 x 3/8" screw
C3	250-406	4	6-32 x 5/8" screw
C4	250-414	6	6-32 x 1" screw
C5	252-3	22	6-32 nut
C6	254-1	21	#6 lockwasher
C7	259-1	1	#6 solder lug

#8 Hardware

KEY No.	HEATH No.	PARTS Per Kit	DESCRIPTION
D1	250-137	4	8-32 x 3/8" screw
D2	252-4	6	8-32 nut
D3	254-2	8	#8 lockwasher
D4	253-42	4	#8 flat washer

1/4" Hardware

KEY No.	HEATH No.	PARTS Per Kit	DESCRIPTION
E1	250-193	4	1/4-20 x 1" screw
E2	250-470	2	1/4-20 x 1-1/2" screw
E3	250-198	2	1/4 x 1-1/2" lag screw
E4	250-451	8	1/4-20 x 2" screw
E5	252-58	1	1/4-20 locknut
E6	252-143	14	1/4-20 nut
E7	253-31	13	1/4" flat washer
E8	254-18	13	1/4" lockwasher

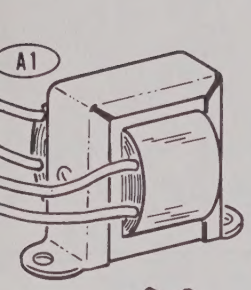
MISCELLANEOUS

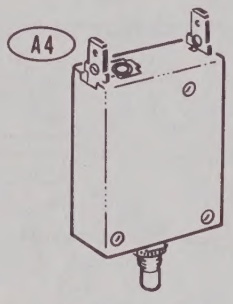
KEY No.	HEATH No.	PARTS Per Kit	DESCRIPTION
F1	25-242	1	53 μF capacitor
F2	258-139	2	Coil spring
F3	262-31	1	Quick-release pin
F4	266-212	2	Idler wheel (plastic)
	268-18	1	Chain
F5	268-19	2	Chain connecting link
F6	354-6	1	Cable tie
F7	268-25	1	Belt
	420-70	1	Motor
F8	431-6	1	2-screw terminal strip
F9	431-41	1	2-lug terminal strip
F10	434-208	1	Lamp socket
F11	455-34	2	Bearing
F12	455-97	2	Shaft collar
	466-35	1	Small pulley
	466-36	1	Large pulley
F13	490-5	1	Nut starter
F14	490-41	1	Allen wrench
	597-308	1	Kit Builders Guide
	597-260	1	Parts Order Form
	391-34	1	Blue and white label
			Manual (See front cover for part number.)
			Solder

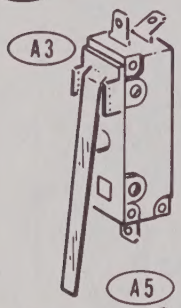
NOTE: The Model GDA-309-2 Arm Extension is not supplied. It is required only for solid doors with jamb or pivot-type hardware. It should be ordered separately.

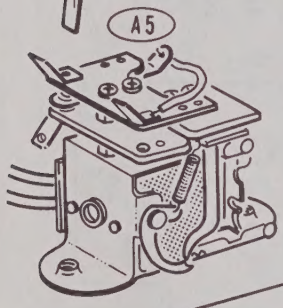
The Model GDA-309-3 Slow Drive Modification Kit, providing slower and more powerful drive for Garage Door Operator Mechanisms, is also available on separate order.

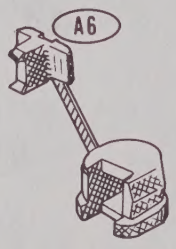
PARTS PICT

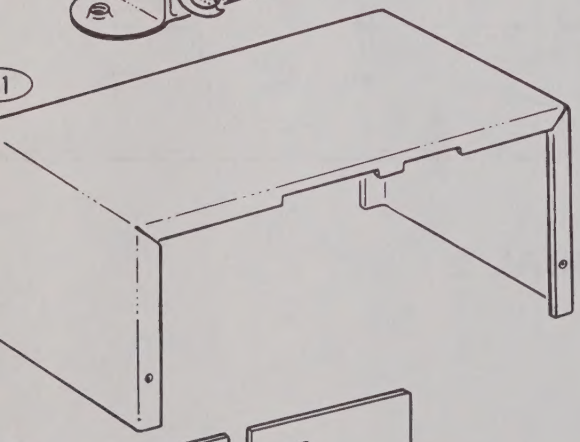


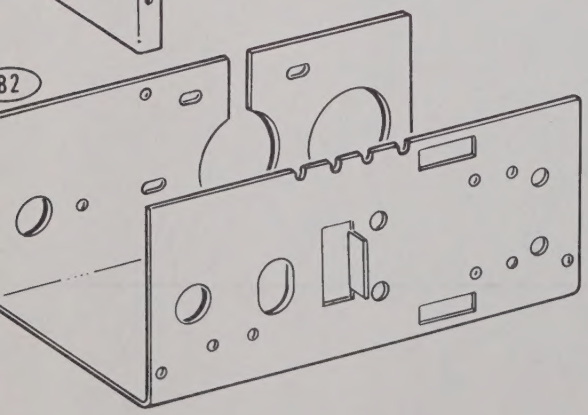


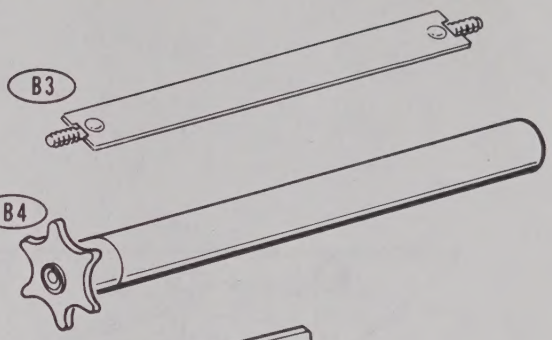


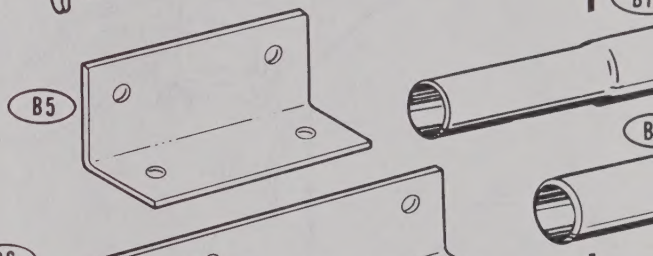


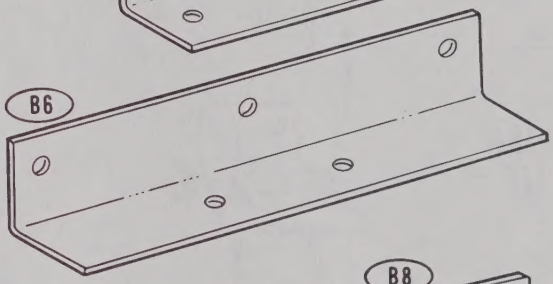


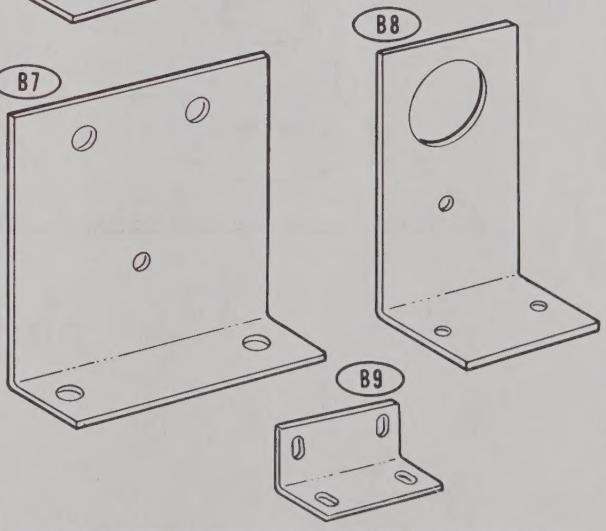


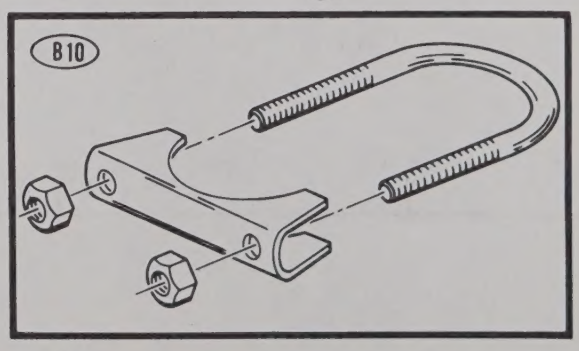


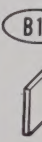




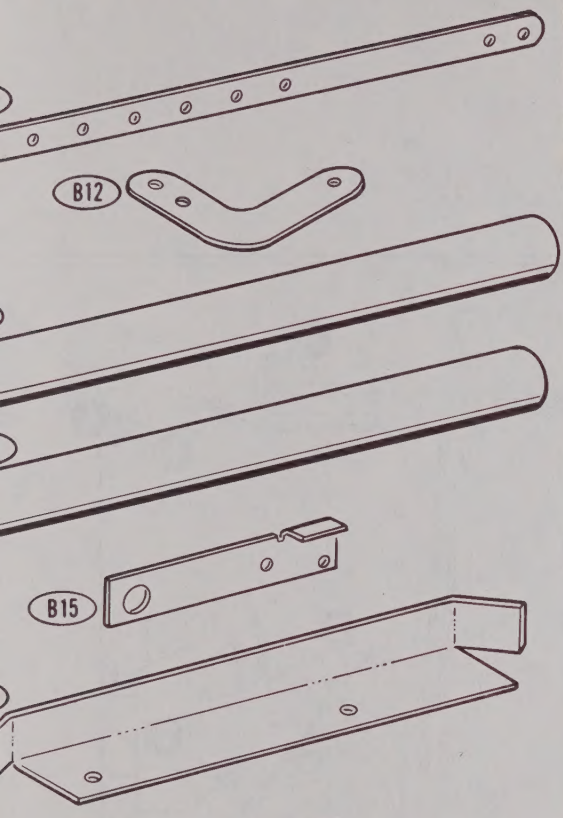








ORIAL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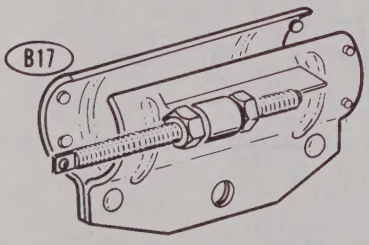
B15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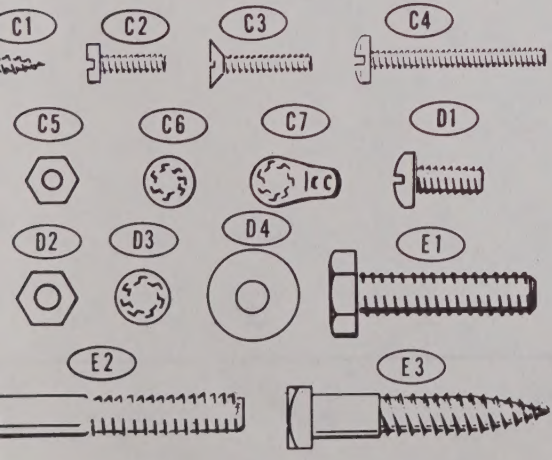
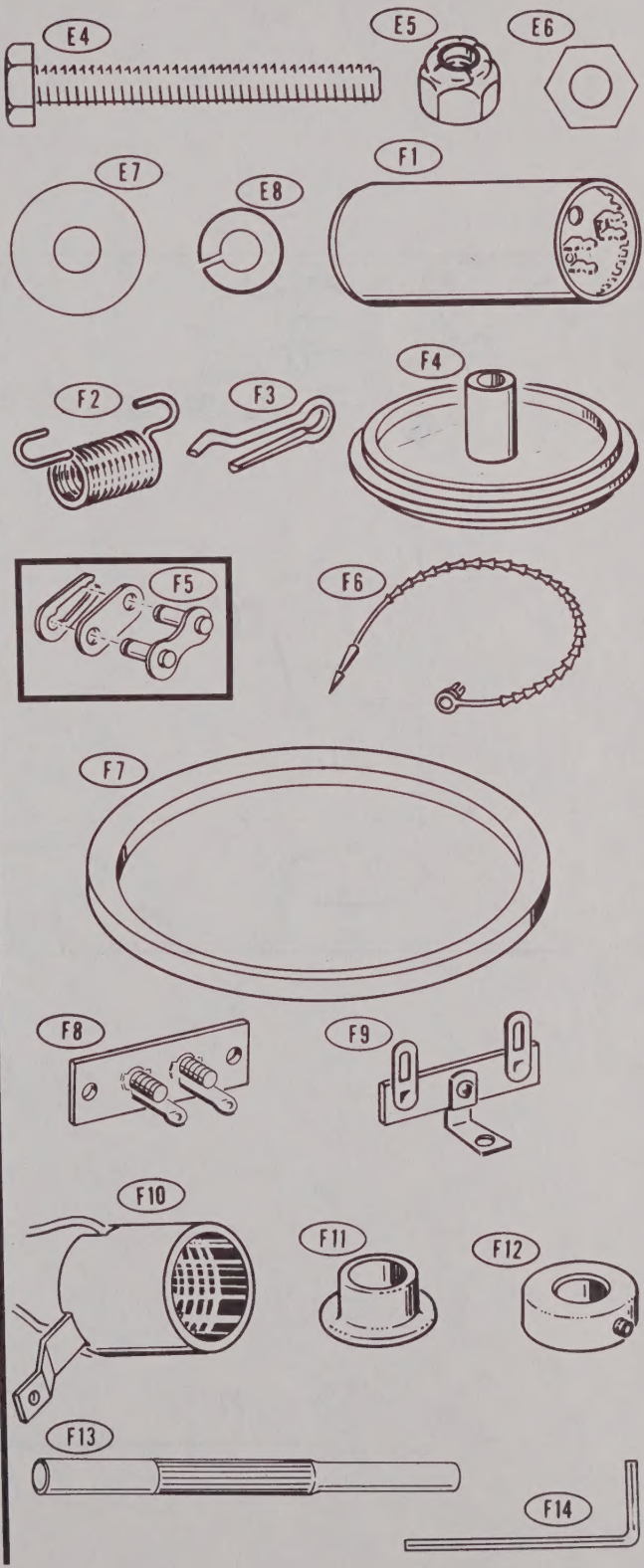

C1
C2
C3
C4
C5
C6
C7
D1
D2
D3
D4
E1
E2
E3


E4
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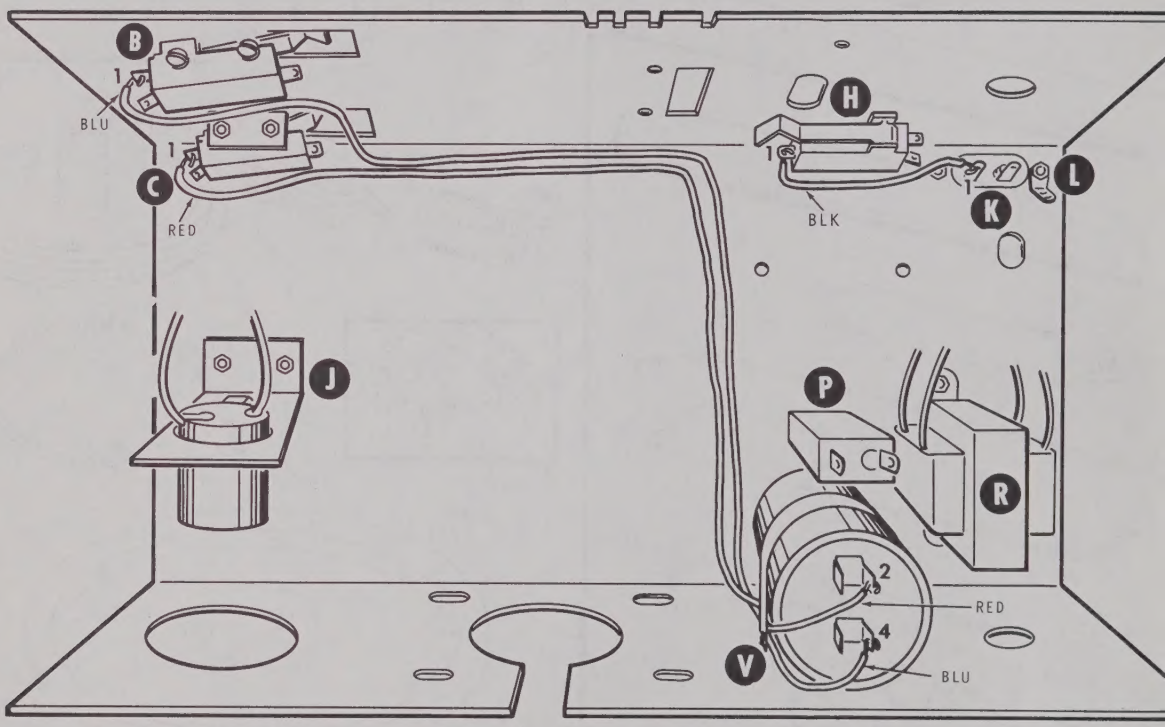
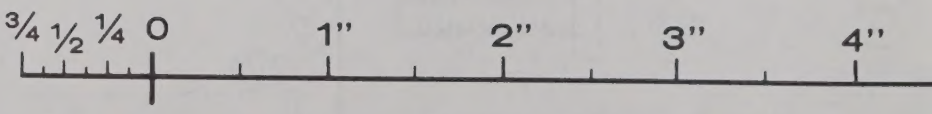
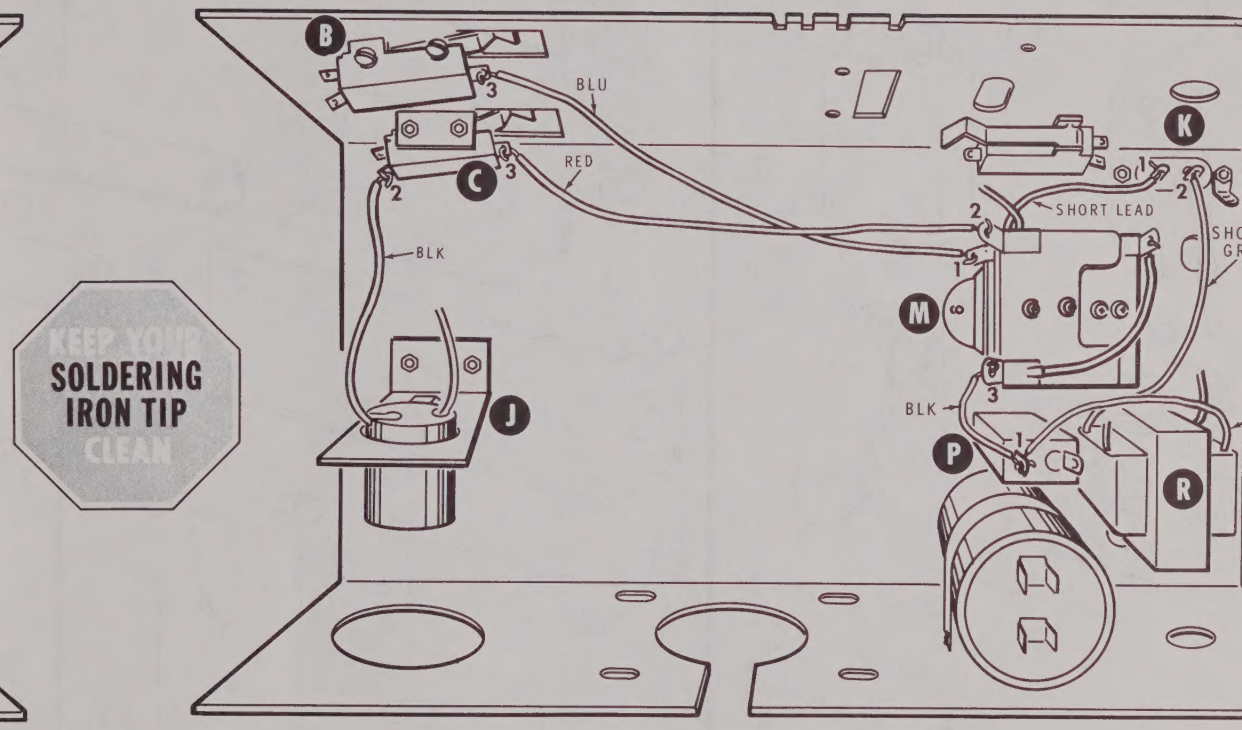


PICTORIAL 1




B
C
J
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BLU
RED
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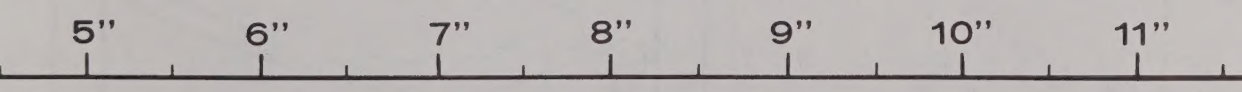
SHORT LEAD
BLK
1
2
3
KEEP YOUR
SOLDERING
IRON TIP
CLEAN

PICTORIAL 2


5"
6"
7"
8"
9"
10"
11"

STEP-BY-STEP ASSEMBLY

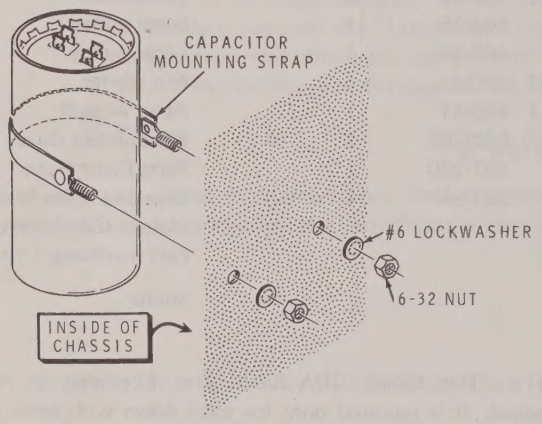
Before starting to assemble this kit, read the "Kit Builders Guide" for complete information on wiring and step-by-step assembly procedures.

INITIAL PARTS MOUNTING AND WIRING

Refer to Pictorial 1 for the following steps.

( ) Position the chassis on a soft cloth as shown. This will prevent scratching the chassis during assembly.

NOTE: A plastic nut starter has been provided with this kit. Use the large end of this nut starter to hold and start 6-32 nuts on screws.



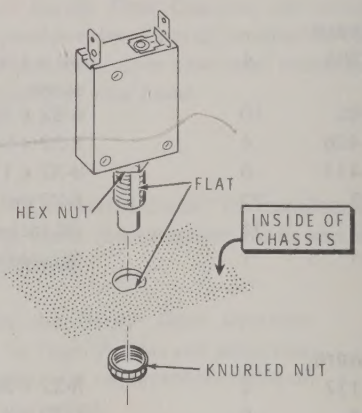
Detail 1A

( ) Refer to Detail 1A and mount the 53 μF capacitor at V. Use the capacitor mounting strap, #6 lockwashers, and 6-32 nuts. Do not overtighten the nuts, as the capacitor can be broken. NOTE: Installation is easier if you install the mounting strap first. Turn the nuts just enough to hold the mounting strap in place. Then push the capacitor into the mounting strap until the capacitor end hits the chassis.

( ) Locate the circuit breaker and remove the knurled nut. Check to see that the hex nut is all the way onto the bushing. See Detail 1B.

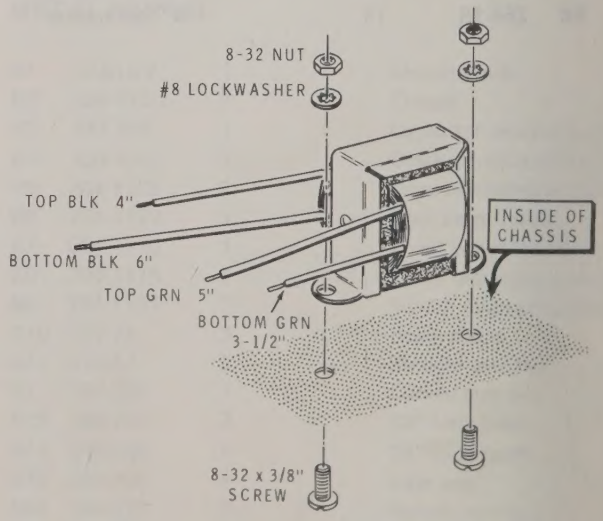
( ) Refer to Detail 1B and mount the circuit breaker at P. Align the flat on the bushing of the circuit breaker with the flat at hole P. Use the knurled nut furnished with the circuit breaker.

Position all parts as shown in the Pictorial. Follow the instructions carefully and read the entire step before performing the operation.



Detail 1B

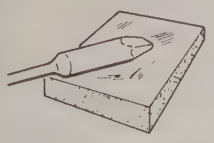
( ) Refer to Detail 1C and cut the leads of the power transformer to the lengths specified. Measure the leads from where they come out of the transformer. Remove 3/8" of insulation from the end of each transformer lead. Twist the small wires together and melt a small amount of solder on the bare end of each lead.



Detail 1C

FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN...

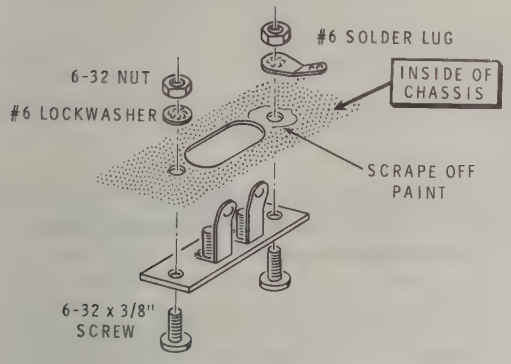
WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



NOTE: The term hardware will be used to refer to the screws, nuts, and lockwashers when parts are being mounted in some of the following steps. The phrase "use 8-32 x 3/8" hardware," for example, means to use an 8-32 x 3/8" screw, one or more #8 lockwashers, and a 8-32 nut. Refer to the Detail called out in the step for the correct number of lockwashers and the correct way to install the hardware.

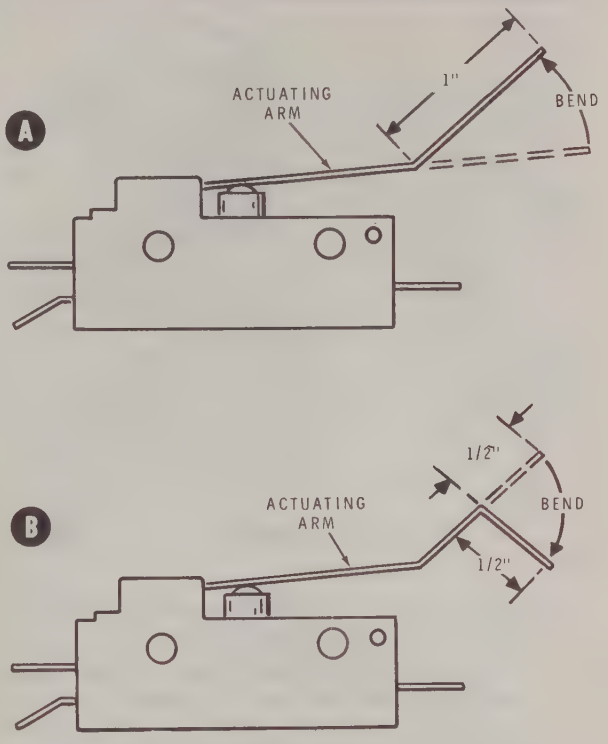
( ) Refer to Detail 1C and mount the power transformer at R with 8-32 x 3/8" hardware.

( ) Refer to Detail 1D and scrape off the paint at the indicated hole. Then mount the 2-screw terminal strip at K with a #6 solder lug at L. Use 6-32 x 3/8" hardware.



Detail 1D

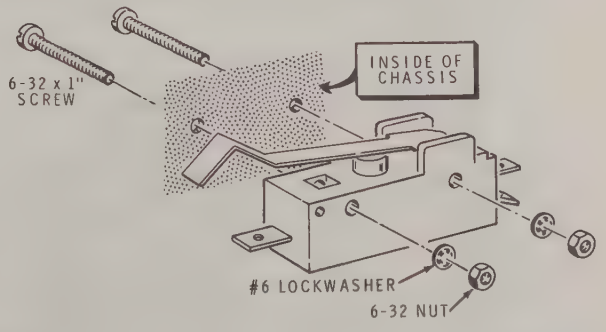
NOTE: In the following step you will be instructed to bend the actuating arm of the microswitches. Carefully bend the actuating arm at only the two locations shown in Detail 1E. For best results, use two pair of pliers. The Detail is full size so that the switch can be placed on the drawing to check the accuracy of the bends.



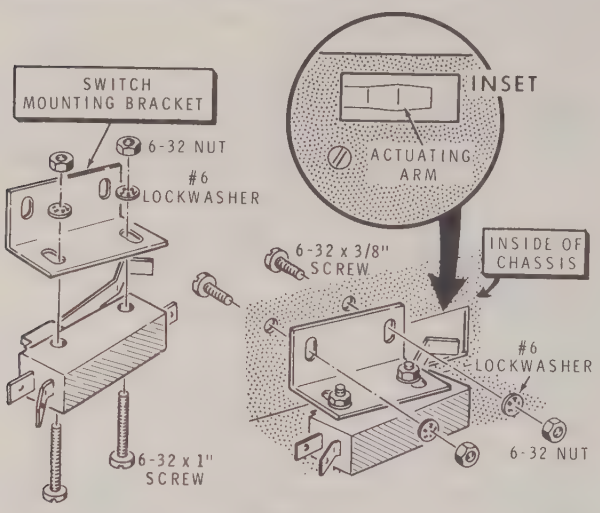
Detail 1E

( ) Refer to Detail 1E and bend the actuating arm of all three microswitches. Make the bends as accurate as possible.

( ) Refer to Detail 1F and mount one of the microswitches at H with 6-32 x 1" hardware. Do not overtighten the hardware, as the switch can be broken.



Detail 1F

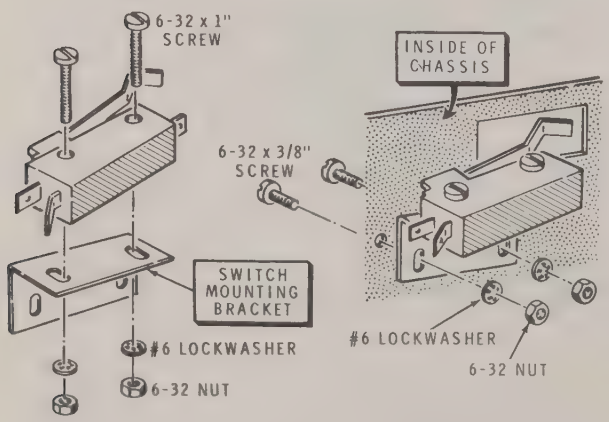


Detail 1G

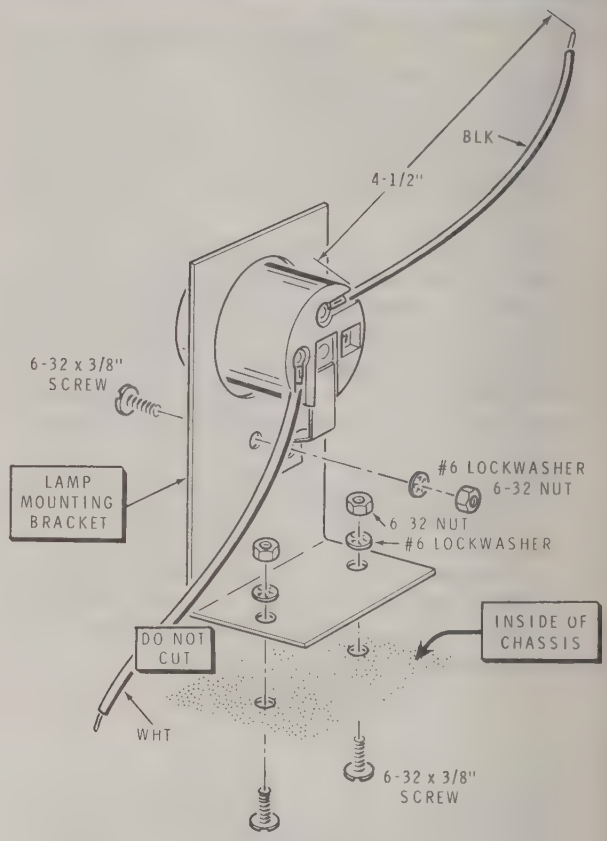
( ) Refer to Detail 1G and mount a microswitch to a switch mounting bracket with 6-32 x 1" hardware. Note that the microswitch is mounted at an angle to the bracket with the screws at opposite extremes in the slotted holes. The switch mounting bracket is symmetrical and either set of holes can be used.

( ) Mount this microswitch and bracket at C with 6-32 x 3/8" hardware. Center the actuating arm of the switch in the cutout in the chassis as shown in the inset drawing in Detail 1G. Then tighten the hardware.

( ) In a similar manner, mount a microswitch on a switch mounting bracket as shown in Detail 1H. Note the angle at which the microswitch is positioned. Use 6-32 x 1" hardware.



Detail 1H



Detail 1J

( ) Mount this microswitch and bracket at B with 6-32 x 3/8" hardware. Center the microswitch actuator in the chassis cutout as before.

( ) Refer to Detail 1J and cut the black lead of the lamp socket to the specified length. Then remove 3/8" of insulation from the end of this lead. Twist the small wires together and melt a small amount of solder on the bare ends of both leads.

( ) Mount the lamp socket to the lamp mounting bracket and mount the bracket to the chassis at J. Use 6-32 x 3/8" hardware. Center the socket in the hole of the bracket and over the large hole in the chassis.

NOTE: When wiring this kit, you will be instructed to prepare lengths of wire ahead of time, as in the following step. To prepare a wire, cut the specified color wire to the indicated length and then remove 3/8" of insulation from each end. Twist the small wires together and melt a small amount of solder on the bare wire ends. The wires are listed in the order in which they are used.

( ) Prepare the following lengths of wire:

WIRE COLOR	LENGTH
Black	4"
Red	17"
Blue	20"

NOTE: Do not shorten any of the wires, even though they seem too long. The wires must be long enough and positioned as shown so that the motor will fit properly when installed later.

Refer to Pictorial 1 for the following steps.

( ) Connect a 4" black wire from lug 1 of switch H (S-1) to lug 1 of terminal strip K (NS).

( ) Connect a 17" red wire from lug 1 of switch C (S-1) to lug 2 of capacitor V (S-1). Position the wire inside the capacitor mounting strap as shown.

( ) Connect a 20" blue wire from lug 1 of switch B (S-1) to lug 4 of capacitor V (S-1). Position the wire inside the capacitor mounting strap as shown.

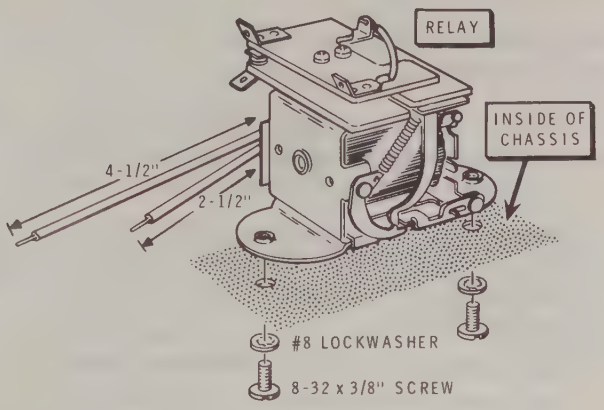
WIRING

Refer to Pictorial 2 (fold-out from Page 4) for the following steps.

( ) Refer to Detail 2A and cut the leads of the relay to the indicated lengths. Then remove 3/8" of insulation from each lead. Twist the small wires together and melt a small amount of solder on the bare end of each lead. Measure the leads from where they come out of the relay coil.

( ) Install the relay at M with 8-32 x 3/8" screws and #8 lockwashers as shown in Detail 2A. Do not pinch any wires between the relay and chassis.

( ) Connect the short relay coil lead to lug 1 of terminal strip K (S-2). Wrap the lead around the lug if it will not fit into the hole of the lug. The remaining relay coil lead will be connected later.



Detail 2A

( ) Prepare the following lengths of wire:

WIRE COLOR	LENGTH
Blue	9"
Red	9"
Black	2"

( ) Connect a 9" blue wire from lug 3 of switch B (S-1) to lug 1 of relay M (S-1).

( ) Connect a 9" red wire from lug 3 of switch C (S-1) to lug 2 of relay M (S-1).

( ) Connect the black lead from lamp socket J to lug 2 of switch C (S-1). Wrap the wire around the lug. The white lead from the lamp socket will be connected later.

( ) Connect a 2" black wire from lug 3 of relay M (S-1) to lug 1 of circuit breaker P (NS). Use the lower hole in the lug of the circuit breaker.

( ) Connect the short black lead from power transformer R to the unused hole in lug 1 of circuit breaker P (S-2).

( ) Connect the short green lead from power transformer R to lug 2 of terminal strip K (NS).

SOLDERING IRON TIP

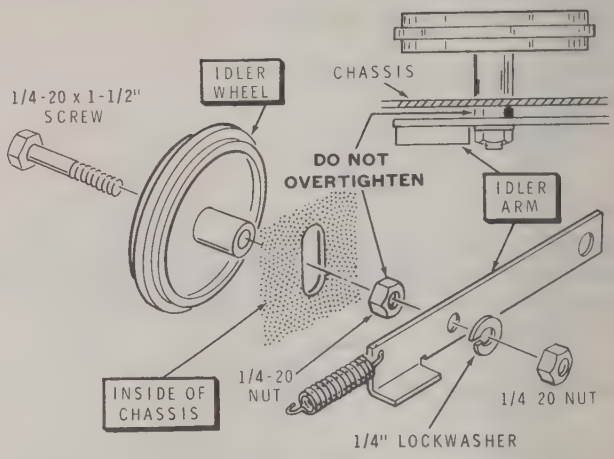
FINAL PARTS MOUNTING AND WIRING

Refer to Pictorial 3 (fold-out from Page 9) for the following steps.

( ) Refer to Detail 3A and fasten one end of a coil spring in the small hole of the idler arm and bend the end of the spring in the idler arm closed as much as possible.

( ) Refer to Detail 3A and install a 1/4-20 x 1-1/2" screw and a 1/4-20 nut into an idler wheel. Tighten the nut to a point that will just allow the idler wheel to turn without binding.

( ) Pass the threaded end of this screw through hole F in the chassis. Secure the screw to the idler arm with a 1/4" lockwasher and a 1/4-20 nut. Tighten this nut securely. Then check to see that the idler wheel is still free to turn. Readjust the nuts if necessary. See Detail 3A.



Detail 3A

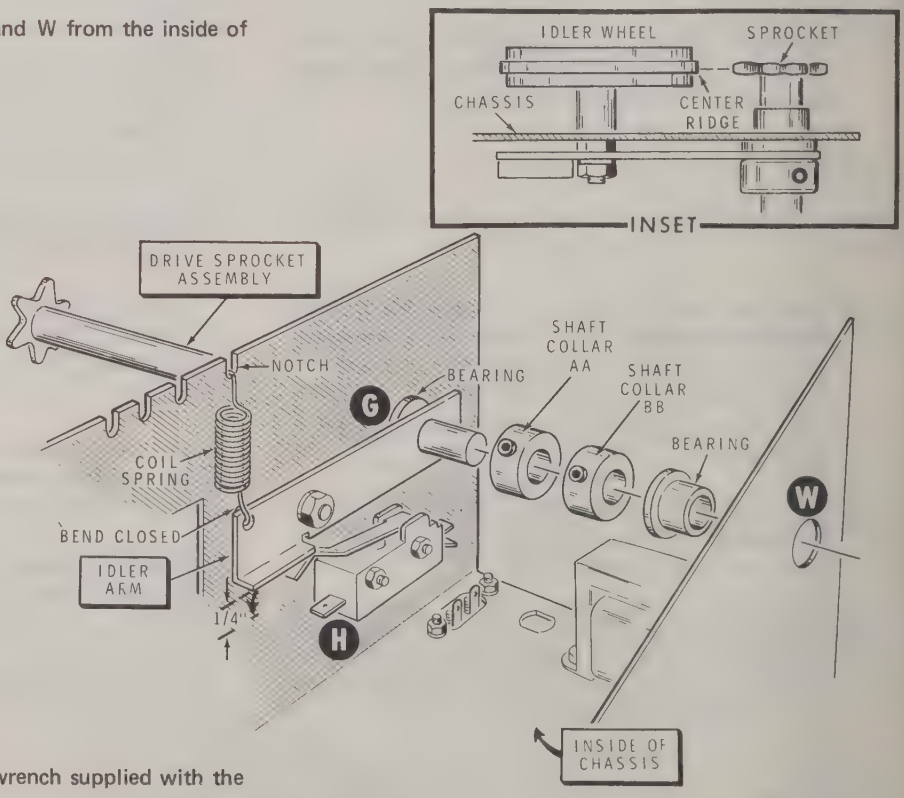
Refer to Detail 3B for the following steps.

( ) Install bearings in holes G and W from the inside of the chassis as shown.

( ) Pass the drive sprocket assembly through bearing G, the large hole in the idler arm, the two shaft collars, and through bearing W.

( ) Hook the free end of the coil spring in the indicated notch located along the edge of the chassis.

( ) Position the drive sprocket assembly so its sprocket is aligned with the center ridge on the idler wheel, as shown in the inset drawing in Detail 3B. Then slide shaft collar AA against the idler arm and bearing G, and tighten the setscrew. Use the allen wrench supplied with the kit.



Detail 3B

NOTE: In the following steps, the chassis cover will be used as a gauge to set the proper distance between the two shaft collars. You may want another person to help you during this process.

( ) Position the chassis cover on the chassis as shown in inset drawing #1 of Pictorial 3 (fold-out from this page). Note that the flanges of the chassis cover are outside of the chassis sides. If necessary, let someone else spread the chassis sides so they just touch the flanges of the cover. This position must be held until the next step is completed.

( ) While keeping the sprocket aligned with the center ridge of the idler wheel, as shown in inset drawing #2, slide shaft collar BB over until it touches bearing W. Then tighten the setscrew in shaft collar BB.

( ) Remove the chassis cover and set it aside until it is called for later.

NOTE: If the sprocket does not turn at this time, do not be concerned. When the chassis is in its final position, the weight of the motor will spread the chassis sides to allow free movement. Should further adjustments be necessary, remember to keep the sprocket aligned with the center ridge of the idler wheel, which acts as a chain guide.

( ) Apply a small amount of oil next to shaft collar AA as shown in inset drawing #2.

( ) Bend the actuating arm of microswitch H, as necessary, so the idler arm must be moved (stretching the coil spring) exactly 1/4" before the microswitch clicks.

Refer to Pictorial 3 (fold-out from this page) for the following steps.

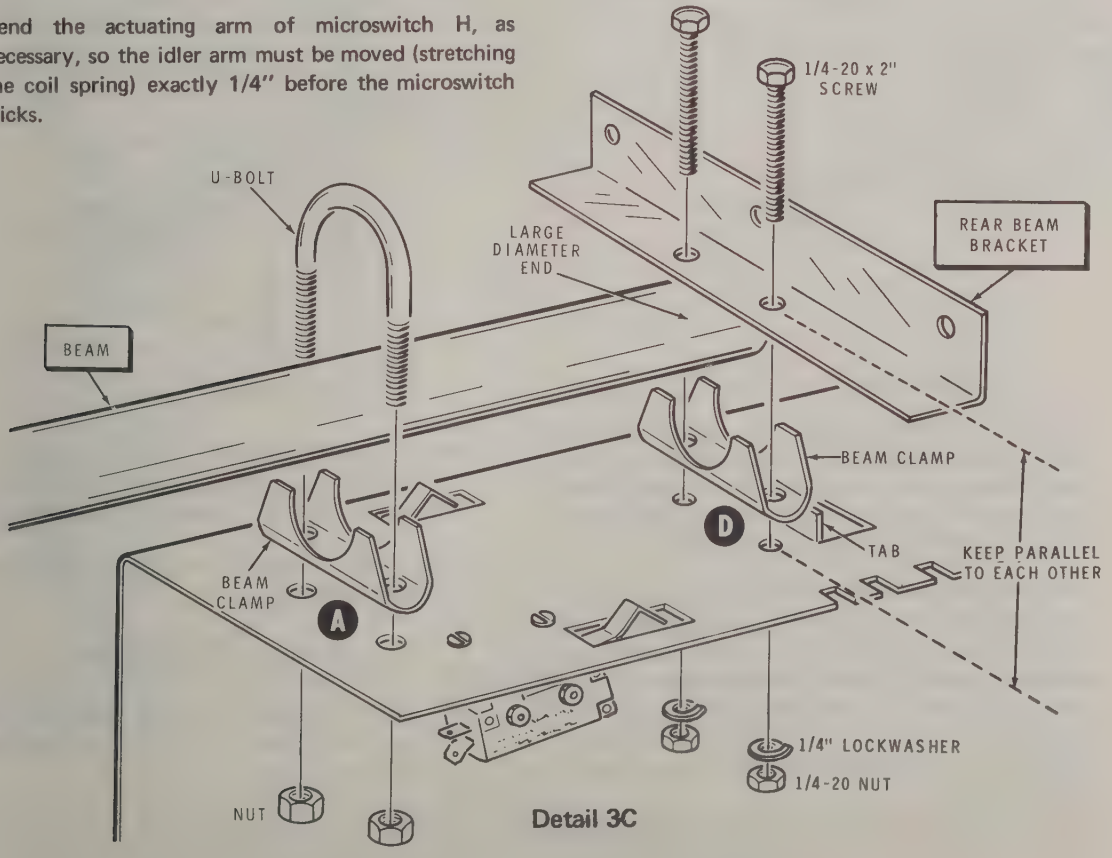
( ) Remove the U-bolt and nuts from a beam clamp. This hardware will not be used.

CAUTION: When performing the following steps, be very careful not to damage the microswitches.

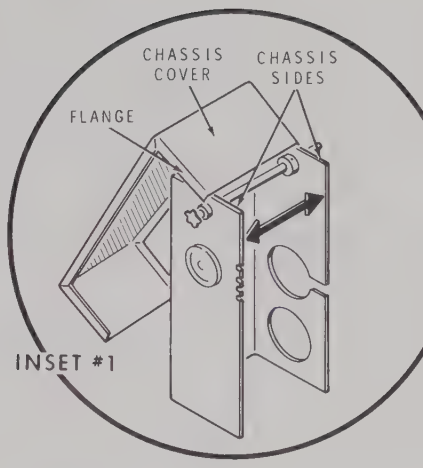
( ) Refer to Detail 3C and mount the large diameter end of a 32" beam at D. Use the rear beam bracket and beam clamp with 1/4-20 x 2" hardware. The end of the beam must be tight against the tab protruding from the chassis. Tighten the hardware finger tight only.

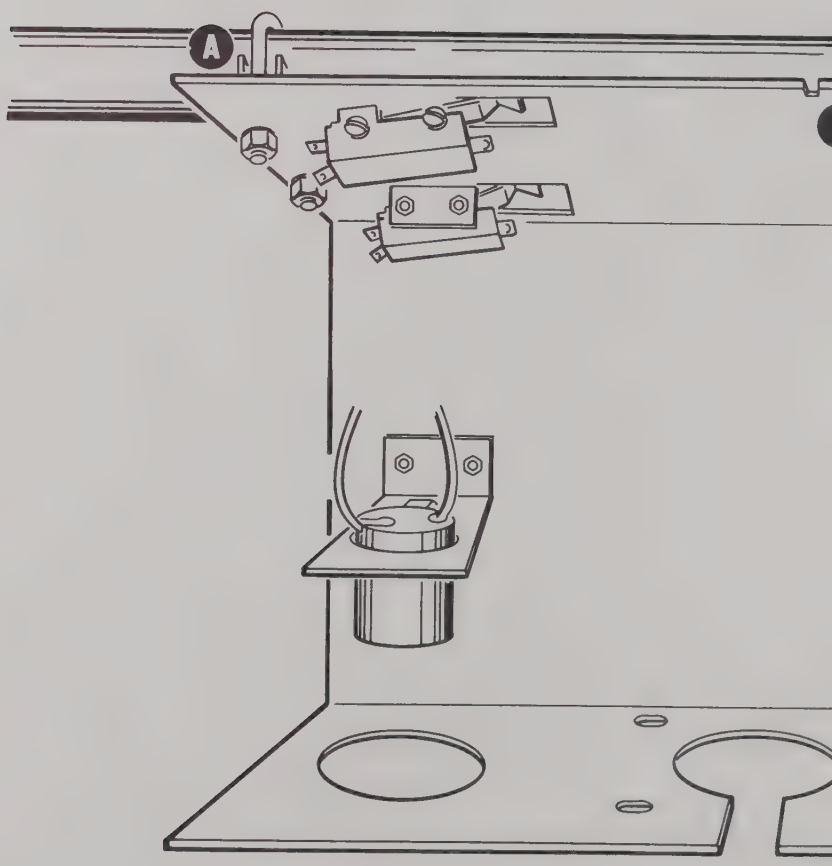
( ) Secure the beam to the chassis with a beam clamp at A. Use the U-bolt and nuts furnished with the clamp. Tighten the hardware finger tight only. See Detail 3C.

( ) Now tighten the beam mounting hardware at A and D on the chassis. Be sure the beam is centered on the chassis and its end is against the chassis tab. Do not dent the beam or chassis when tightening the hardware. Keep the rear beam bracket parallel to the surface of the chassis.

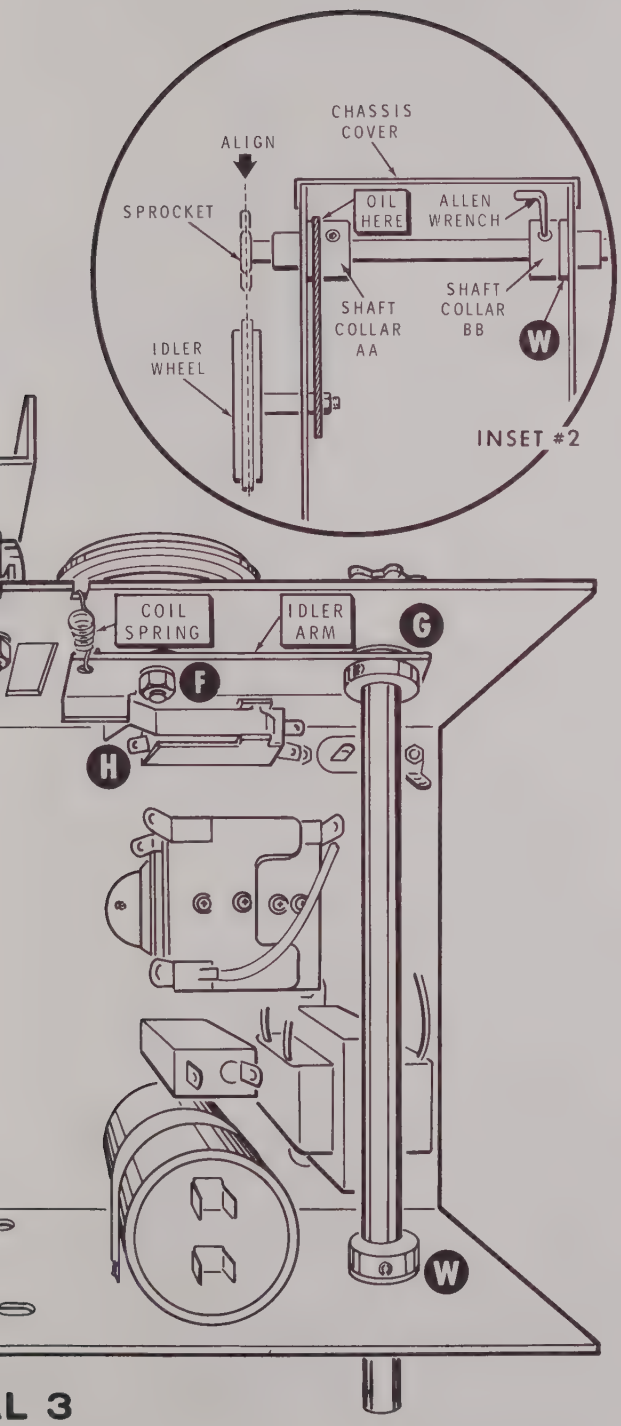


Detail 3C

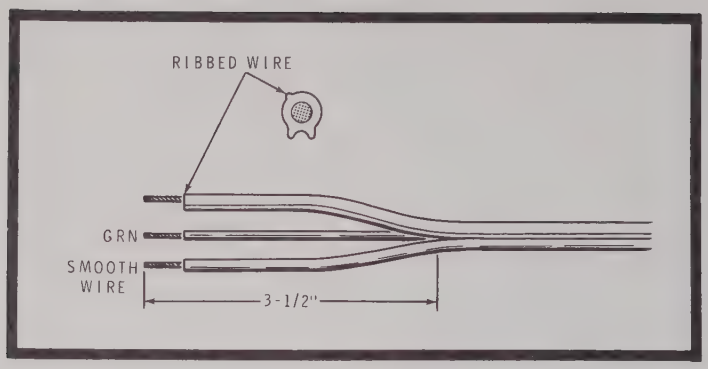




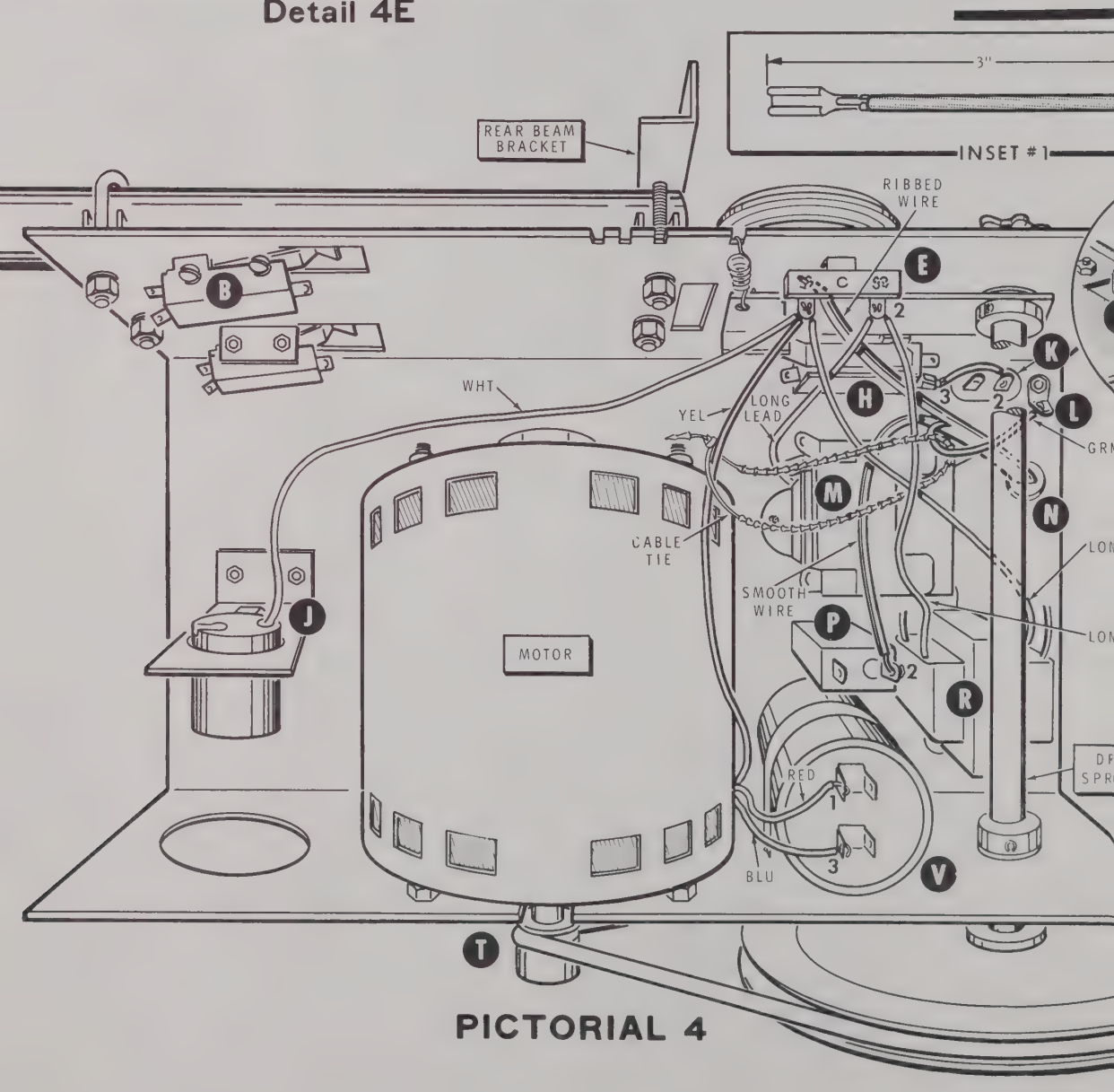
PICTOR


CHASSIS COVER
ALIGN
SPROCKET
OIL HERE
ALLEN WRENCH
SHAFT COLLAR AA
SHAFT COLLAR BB
W
IDLER WHEEL
INSET #2
COIL SPRING
IDLER ARM
G
F
H
W

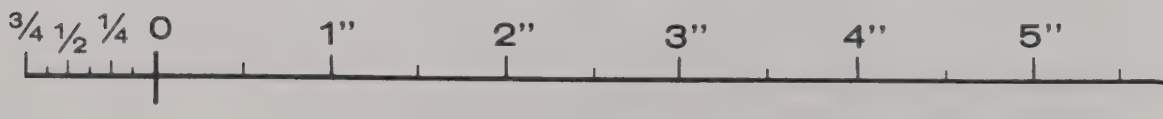
L 3

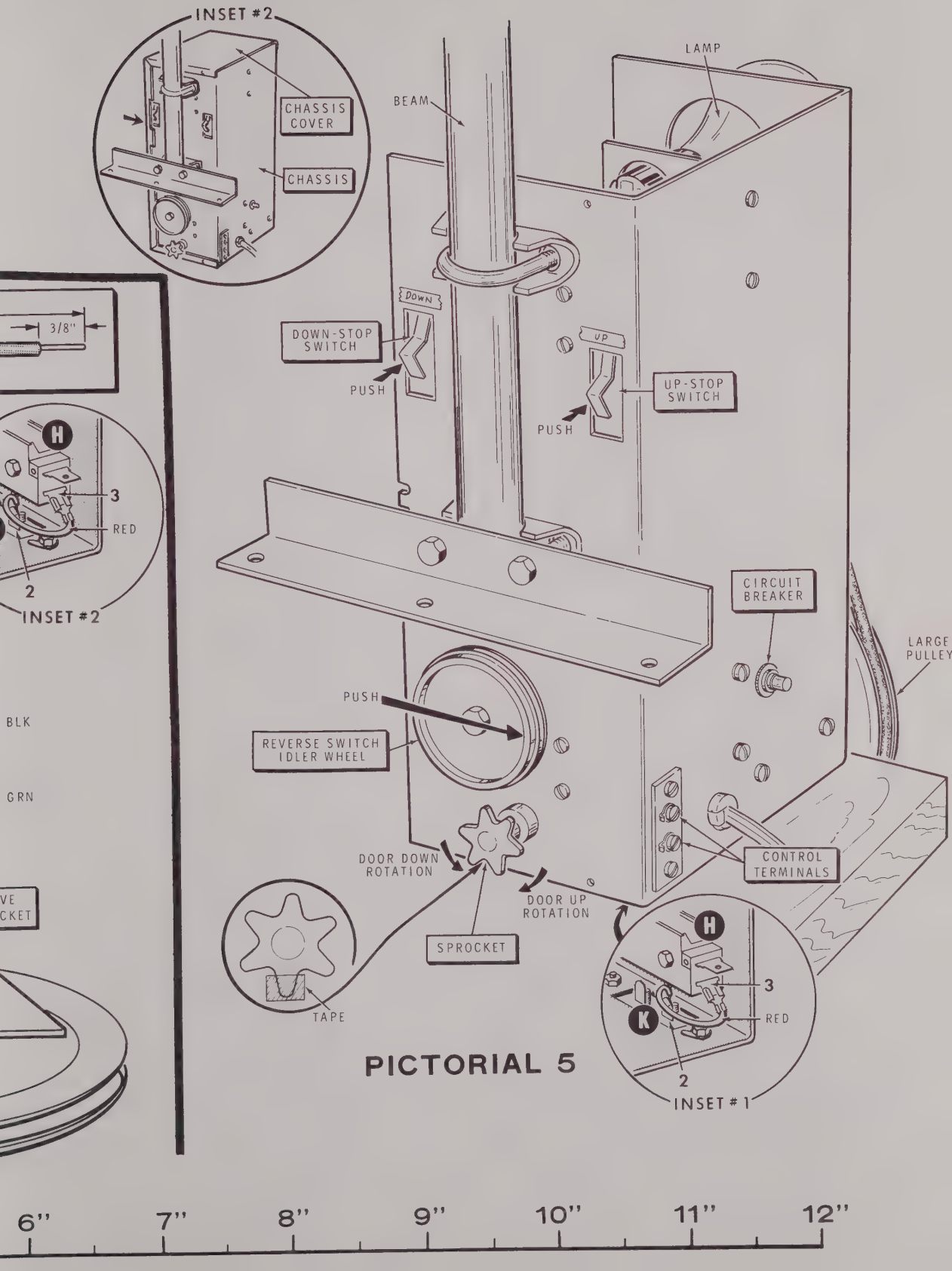


Detail 4E

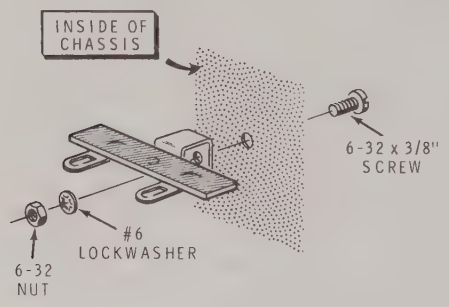


PICTORIAL 4




INSET #2
CHASSIS COVER
CHASSIS
BEAM
LAMP
DOWN
DOWN-STOP SWITCH
PUSH
UP
UP-STOP SWITCH
PUSH
CIRCUIT BREAKER
LARGE PULLEY
PUSH
REVERSE SWITCH IDLER WHEEL
DOOR DOWN ROTATION
DOOR UP ROTATION
CONTROL TERMINALS
SPROCKET
TAPE
H
3
RED
2
INSET #1
3/8"
H
3
RED
2
INSET #2
BLK
GRN
VE
CKET
6"
7"
8"
9"
10"
11"
12"

PICTORIAL 5

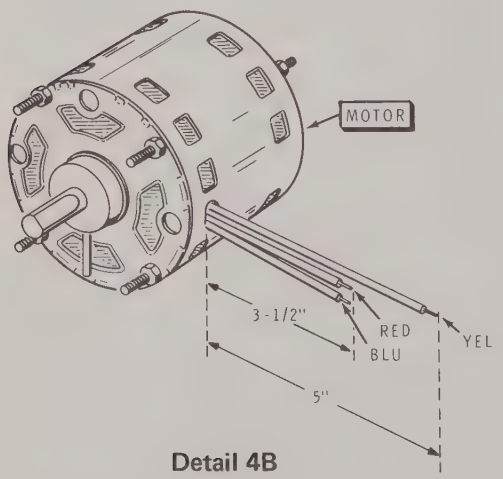


Detail 4A

Refer to Pictorial 4 for the following steps.

( ) Refer to Detail 4A and mount the 2-lug terminal strip at E with 6-32 x 3/8" hardware.

( ) Temporarily remove switch bracket B from the chassis. Position the switch and bracket out of the way at the left end of the chassis.

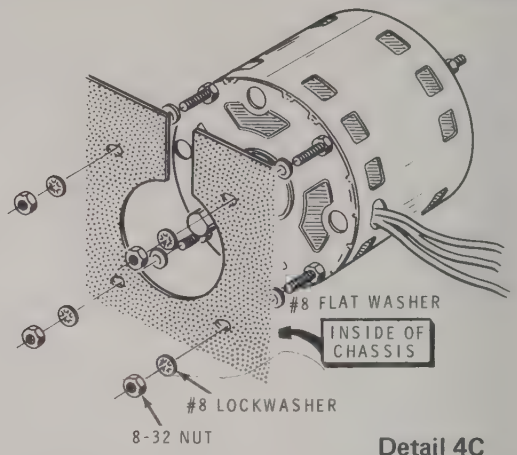


Detail 4B

( ) Refer to Detail 4B and cut the motor leads to the specified lengths. Save the cut-off red lead for use later. Remove 3/8" of insulation from each motor lead. Twist the fine wires together and melt a small amount of solder on the bare end of each lead.

( ) Refer to Detail 4C and install the motor at T with 8-32 nuts, #8 flat washers, and #8 lockwashers as shown. Position the motor so its leads are next to capacitor V. Be sure no wires are pinched between the motor and chassis. Do not tighten the nuts at this time. NOTE: It may be necessary to spring the chassis open slightly to clear the nut that holds the rear beam bracket in place.

( ) Reinstall switch bracket B on the chassis. Be sure to center the switch actuator arm in the cutout of the chassis.

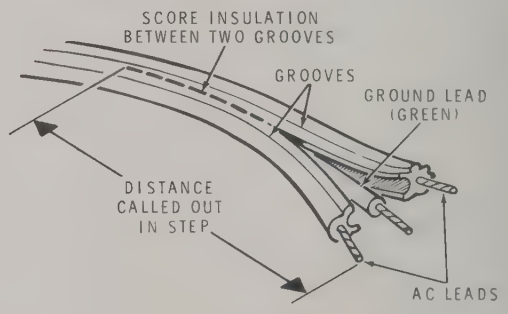


Detail 4C

( ) Refer to inset drawing #1 in Pictorial 4 and prepare the end opposite the connector of the red wire that was cut from the motor.

( ) Refer to inset drawing #2 in Pictorial 4 and connect the end of this wire that is opposite the connector to lug 2 of terminal strip K (S-2).

( ) Push the connector of this red wire onto lug 3 of switch H.



Detail 4D

( ) Refer to Detail 4D and split the outer insulation of the line cord for 3-1/2 inches, as follows, so you do not cut into the protective insulation for the AC leads.

1. Use a knife point to score a 00" line, BETWEEN the two grooves.

2. Turn the cord over and repeat step 1.

3. Grasp the lead ends by the insulation and pull the leads apart. The line cord will separate on the scored lines.

( ) Twist the small wires together and melt a small amount of solder on the bare ends of all three wires. See Detail 4E.

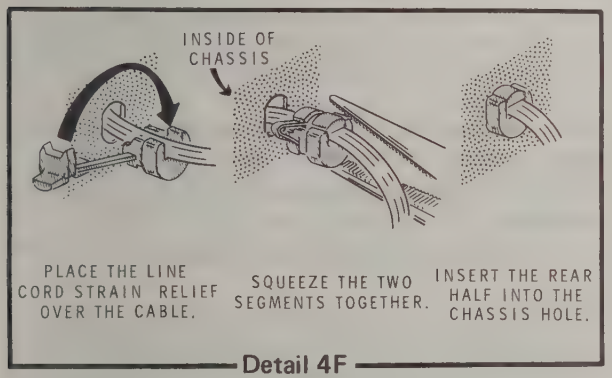
( ) Pass the end of the line cord through hole N.

Connect the line cord wires as follows:

( ) Ribbed outside wire to the bottom hole in lug 1 of terminal strip E (S-1).

( ) Smooth outside wire to lug 2 of circuit breaker P (S-1).

( ) Green wire to solder lug L (S-1).


INSIDE OF CHASSIS
PLACE THE LINE CORD STRAIN RELIEF OVER THE CABLE.
SQUEEZE THE TWO SEGMENTS TOGETHER.
INSERT THE REAR HALF INTO THE CHASSIS HOLE.
Detail 4F

( ) Refer to Detail 4F and install the line cord strain relief in hole N.

( ) Connect the white lead coming from lamp socket J to lug 1 of terminal strip E (NS).

( ) Connect the yellow motor lead to lug 1 of terminal strip E (NS).

( ) Connect the red motor lead to lug 1 of capacitor V (S-1).

( ) Connect the blue motor lead to lug 3 of capacitor V (S-1).

( ) Connect the long black lead from transformer R to lug 1 of terminal strip E (S-3). The line cord lead has already been soldered to this lug, making a total of four wires at this connection.

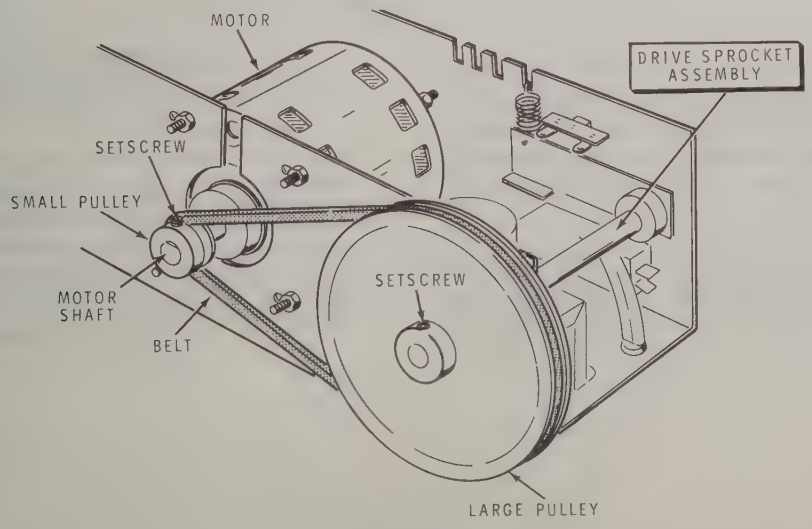
( ) Connect the long lead from the coil of relay M to lug 2 of terminal strip E (NS).

( ) Connect the long green lead from transformer R to lug 2 of terminal strip E (S-2).

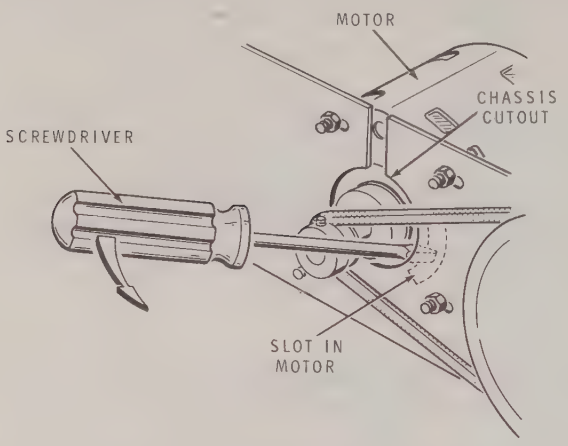
( ) Install the cable tie around the indicated wires as shown in Pictorial 4 and pull it tight. This is to keep the wires away from the drive sprocket.

( ) Slide the motor towards the drive sprocket assembly as far as the slots in the chassis will permit. See Detail 4F.

( ) Refer to Detail 4G and install the small pulley, the large pulley, and the belt all at the same time. Position the pulleys as shown with their outside edges flush with the ends of the motor shaft and drive sprocket assembly shaft.



Detail 4G



Detail 4H

( ) Refer to Detail 4H and position the blade of a screwdriver through the chassis cutout and into the slot in the motor. Now pry the motor away from the large pulley to put tension on the belt. Then tighten the motor mounting nuts. CAUTION: Extend the blade of the screwdriver only 1/4" into the slot in the motor. Otherwise, the motor may be damaged.

This completes the wiring of this mechanism. check to see that all connections are soldered. Shake out any wire clippings and/or solder splashes. Be sure all wires are positioned away from the three microswitches, the relay, and the reversing arm.

TESTING

In the following steps the chassis assembly will be checked for proper operation before the assembly of the Mechanism is completed. If the chassis assembly fails to function as described in any step, unplug the line cord immediately. Then refer to the "In Case of Difficulty" section of this Manual.

Position the chassis assembly near the edge of a table (on a soft cloth) or on a stack of books so the large pulley is free to turn. Have another person hold the beam down to prevent the chassis assembly from moving around when the mechanism is turned on and off or reversed. Read through the entire test procedure before operating the mechanism. In this way you will be familiar with what to expect from the chassis assembly.

WARNING: Never put your hand inside the chassis assembly when the line cord is plugged into an AC outlet, as there is 120 VAC line voltage present at many connections. Also, keep your hands away from the two pulleys and the sprocket to avoid personal injury. In some steps you will be instructed to short together the control terminals. This is easily done with the blade of a screwdriver. Although there is only 24 VAC on these terminals, you should use a screwdriver with an insulated handle.

Study Pictorial 5 (fold-out from Page 10 which will be used for the following steps) to familiarize yourself with the location of the various microswitches, etc., on the chassis assembly.

( ) Install a 60-watt lamp in the lamp socket.

( ) Operate the DOWN-STOP SWITCH, UP-STOP SWITCH and the REVERSE SWITCH by pushing on the microswitch actuator arms (push on the idler wheel for the REVERSE SWITCH). Each microswitch should click once when the actuator is pushed in the direction of the arrow, and again when it is released. The DOWN-STOP and UP-STOP SWITCHES should move approximately 1/8" before they click, and the REVERSE SWITCH should move approximately 1/4". If any one does not act as described, carefully bend the actuator arm of that microswitch in the direction necessary to obtain proper operation.

NOTES:

1. When the line cord is plugged into a 120 Vac outlet in the following step, the motor will start and continue to turn in one direction. It will be necessary to determine which direction the sprocket is rotating; therefore, refer to the door-up and door-down rotation arrows near the sprocket in Pictorial 5. The direction of rotation of the sprocket can be seen easier if you place a piece of tape on one of the teeth of the sprocket. You may also wish to place a piece of tape marked UP near the UP-STOP switch and a piece of

tape marked DOWN near the DOWN-STOP switch. This will help to identify the switches in the following steps.

2. The motor used in the mechanism is an intermittent-type designed specifically for this type used. Therefore, the motor will get warm rapidly when running. If it is run too long, the circuit breaker will trip and turn the motor off. This is normal. If this happens, wait a few minutes for the motor to cool off, and reset the circuit breaker by pushing its button in. The motor should then operate.

WARNING: Always operate the REVERSE SWITCH by pushing on the inside ridge of the idler wheel that the PUSH arrow points to. Never push on the outside of the REVERSE SWITCH idler wheel, as the wheel can turn; thus allowing your finger to be pinched between the idler wheel and sprocket. For this reason, use a screwdriver to operate the REVERSE SWITCH. Avoid wearing clothing that can be caught in moving parts of the mechanism.

( ) Plug the line cord of the chassis assembly into a 120 Vac outlet. The motor should start to turn. If nothing happens, push in on the CIRCUIT BREAKER button to start the motor. NOTE: If the sprocket turns in the door-up direction, complete the following step. However, if the sprocket turns in the door-down direction, disregard the following step.

( ) Push the UP-STOP SWITCH. The motor should stop and the lamp will turn on. This condition will continue as long as this switch is held in. (NOTE: If the switch is released, the motor will start and continue to turn in the door-up direction.) Now release the UP-STOP SWITCH and push (and release immediately) the REVERSING SWITCH. The sprocket should reverse direction and now be turning in the door-down direction.

( ) Push the DOWN-STOP SWITCH. The motor should stop. The motor will remain off as long as the switch is held in. (NOTE: If the switch is released, the motor will start and continue to turn in the door-down direction). Keep the DOWN-STOP SWITCH pushed in, and proceed to the next step.

( ) Short together the CONTROL TERMINALS. As soon as the motor starts, release the DOWN-STOP SWITCH. The sprocket should now be turning in the door-up direction.

( ) Push the UP-STOP SWITCH. The motor should stop and the lamp will turn on. Hold the switch in.

( ) Short together the CONTROL TERMINALS. As soon as the motor starts, release the UP-STOP SWITCH. The sprocket should be turning in the door-down direction and the lamp will turn off.

( ) Push (and release immediately) the REVERSE SWITCH. The sprocket should reverse and now be turning in the door-up direction.

( ) Make sure the sprocket is turning in the door-up direction. If not, push the REVERSING SWITCH. Then unplug the line cord from the ac receptical. NOTE: It is important this step be performed, as this presets the relay for proper door travel when the Mechanism is installed and fastened to the door for the first time. Be very careful when handling the Mechanism that you do not accidentally operate the relay by hand. This completes the tests.

( ) Remove the light bulb from the chassis assembly and the tape from the sprocket. Set the lamp aside until called for later.

( ) Refer to inset drawing #1 in Pictorial 5 and disconnect the connector of the red wire from lug 3 of microswitch H. Then wrap tape on this connector so it cannot make any electrical contact with the chassis or other connections.

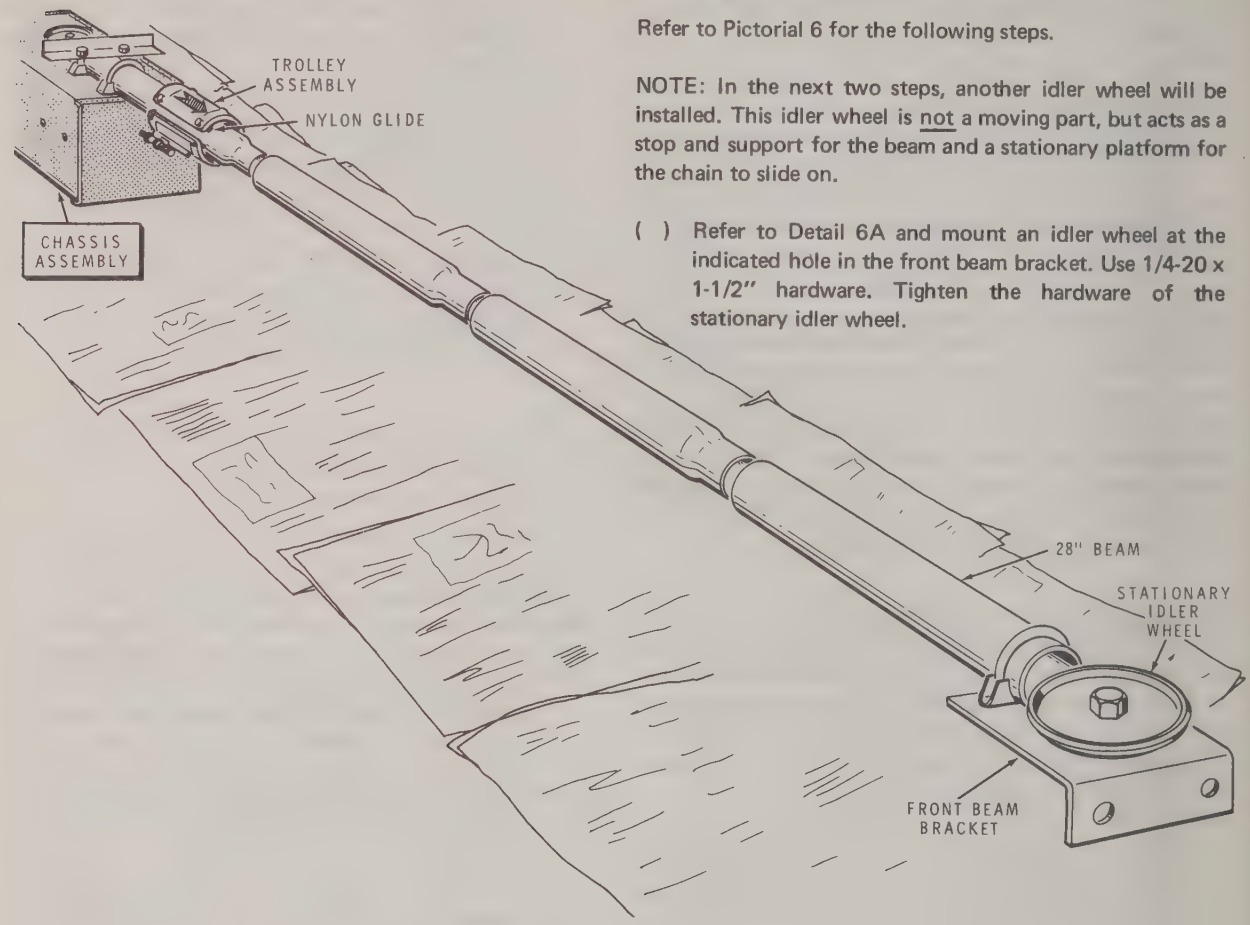
( ) Refer to inset drawing #2 in Pictorial 5 and slide the chassis cover all the way onto the chassis. It is not necessary to install any screws into the chassis cover at this time.

BEAM AND TROLLEY ASSEMBLY

Refer to Pictorial 6 for the following steps.

NOTE: In the next two steps, another idler wheel will be installed. This idler wheel is not a moving part, but acts as a stop and support for the beam and a stationary platform for the chain to slide on.

( ) Refer to Detail 6A and mount an idler wheel at the indicated hole in the front beam bracket. Use 1/4-20 x 1-1/2" hardware. Tighten the hardware of the stationary idler wheel.



PICTORIAL 6

( ) Refer to Detail 6A and mount the 28" long beam (the one with both ends having the same diameter) to the front beam bracket with a beam clamp. Use the U-bolt and nuts furnished with the clamp. Push the beam as tight as possible against the stationary idler wheel as shown in Pictorial 6. Be careful not to dent the beam or deform the bracket when tightening the nuts.

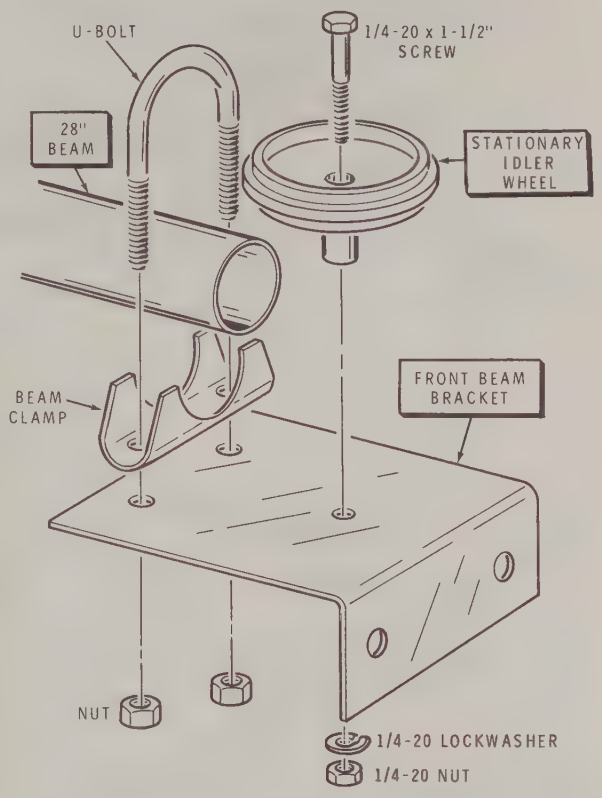
( ) Spread newspapers on the floor to provide a working area 12 feet long. This will protect the floor from the oily chain (to be installed later) and prevent the chain from picking up dust and dirt.

( ) Position the chassis assembly at one end of the working area as shown in Pictorial 6.

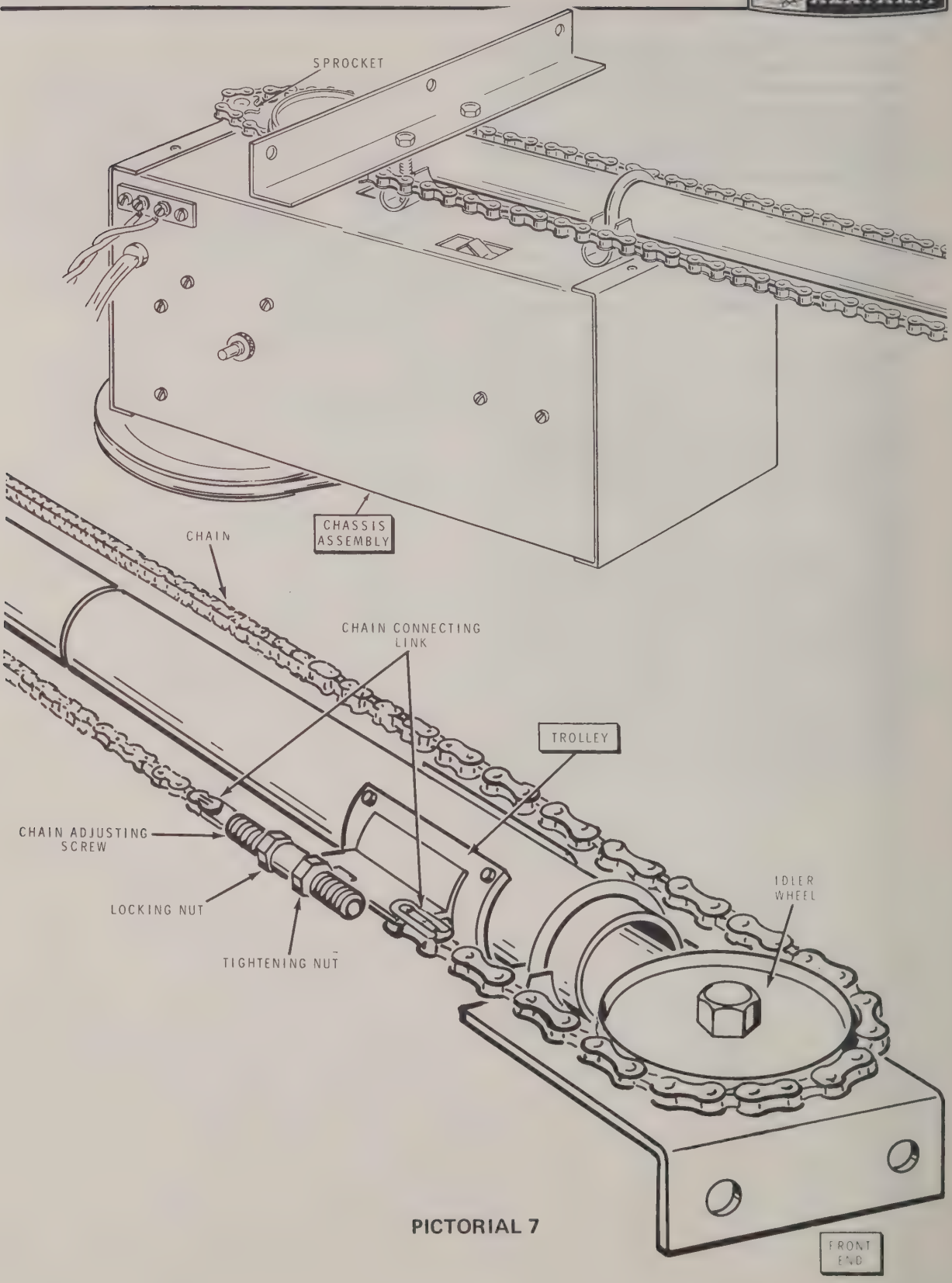
( ) Slide the trolley assembly onto the beam that is fastened to the chassis assembly. Be sure the arrow on the trolley assembly is pointing away from the chassis assembly and that all eight nylon glides are in their holes in the trolley assembly.

( ) Fit the remaining beam sections together and push them onto the beam mounted on the chassis assembly. Push the small end of each section all the way into the large end of another section. Use a twisting action if necessary, however, avoid using tools to turn the beam sections. Wrench marks in the beam sections could cause the nylon glides of the trolley assembly to wear.

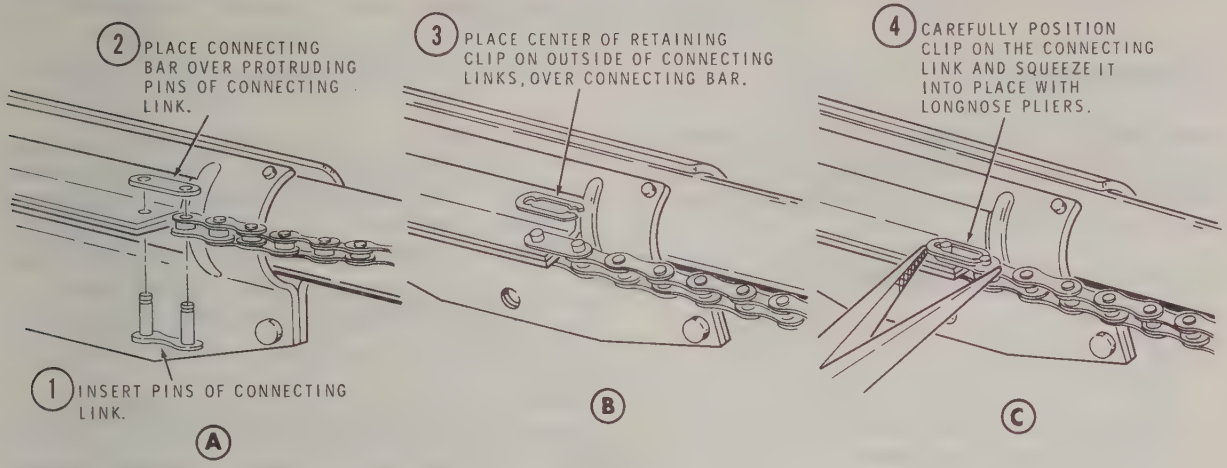
( ) Fit the beam section mounted to the front beam bracket into the other beam to complete the beam assembly. Position the front beam bracket as shown.



Detail 6A


SPROCKET
CHASSIS ASSEMBLY
CHAIN
CHAIN CONNECTING LINK
TROLLEY
CHAIN ADJUSTING SCREW
LOCKING NUT
TIGHTENING NUT
IDLER WHEEL
FRONT END

PICTORIAL 7


2 PLACE CONNECTING BAR OVER PROTRUDING PINS OF CONNECTING LINK.
3 PLACE CENTER OF RETAINING CLIP ON OUTSIDE OF CONNECTING LINKS, OVER CONNECTING BAR.
4 CAREFULLY POSITION CLIP ON THE CONNECTING LINK AND SQUEEZE IT INTO PLACE WITH LONGNOSE PLIERS.
1 INSERT PINS OF CONNECTING LINK.
A
B
C

Detail 7A

Refer to Pictorial 7 for the following steps.

INSTALLING CHAIN

NOTE: The chain, which will be installed in the following steps, is lightly oiled to prevent rusting and to provide smooth operation. Therefore, do not clean the oil off the chain. However, the chain will pick up dust and dirt easily and should be handled carefully.

( ) Slide the trolley assembly to the front (door end) of the beam.

( ) Unwrap the chain and position it around the sprocket at the chassis assembly end and around the idler wheel at the front end of the beam.

( ) Refer to Detail 7A and attach the chain to the front of the trolley assembly with a chain connecting link.

( ) In a like manner, attach the other end of the chain to the adjusting screw with a chain connecting link. Remove the adjusting screw if necessary.

( ) Check to see that the chain is still positioned properly. Then tighten the tightening nut only enough to hold the chain in place on the Mechanism. Final adjustment will be performed after the Mechanism is installed. NOTE: It may be necessary to turn the locking nut further onto the adjusting screw to get the chain tight enough.

INSTALLATION

CONSIDERATIONS

These instructions were written to make the Mechanism installation a one-man operation. However, if a helper is available, his assistance would probably speed up the installation.

To install and adjust the Mechanism you will need the following tools:

DESCRIPTION

3/8" end, box or socket wrench
7/16" end, box or socket wrench
1/2" end, box or socket wrench
8" or 10" adjustable wrench
Pair of pliers
Screwdriver
Hammer
Wood saw and possibly a hack saw
Carpenters level (or a piece of 2" x 4" board 2 to 3 feet long)
Measuring tape
#28 (9/64") drill
1/4" drill
Electric or hand drill
Pencil
6 or 7 foot stepladder

Place the tools listed above, the remaining parts, and the Mechanism in the garage. Be careful not to let dirt get into the moving parts of the Mechanism.

NOTE: The following instructions are divided into two separate sections: one section is for folding or one-piece overhead track-type doors; the other section is for one-piece jamb and pivot-type doors. It is a good idea to preread the installation instructions that apply to your type of door at this time. This will let you determine what additional materials (such as boards, nails, or special hardware for mounting to masonary, paneled, or metal surfaces) will be needed to install the Mechanism in your garage. Also, make sure an unswitched 120 Vac outlet is located within 5 feet of where the chassis assembly end of the Mechanism will be installed. Any additional materials should be obtained locally.

After conveniently placing the Mechanism and all necessary tools, parts, and mounting materials in your garage, proceed to the installation instructions that pertain to your type of door: "Overhead-Track-Type Doors" or "Jamb and Pivot-Type Doors" (on Page 28).

OVERHEAD TRACK-TYPE DOORS

( ) Make sure that the garage door travels freely and that the counterbalance system is adjusted properly. NOTE: The Garage Door Operator Mechanism was designed as a device to conveniently open and close your garage door; it is not intended to operate doors that are difficult to open by hand. For this reason, it is important that the door move freely as it is opened and closed.

WARNING: If it is necessary to adjust the tension of your garage door counterbalance springs for easier operation, open the door and place a stepladder or prop under the door as a safety precaution. This will keep the door from closing accidentally when the springs are adjusted and, thus, prevent possible personal injury or damage to the door.

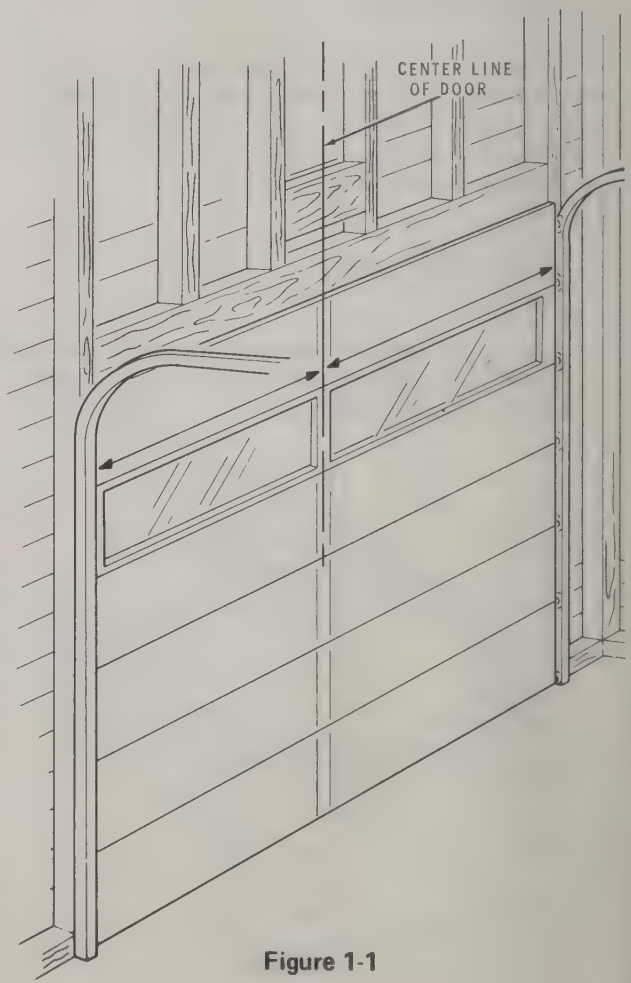


Figure 1-1

( ) Remove any locking or latching device from your garage door before installing the Mechanism. You may either remove the locking device or secure its parts so that it will not lock the garage door closed.

( ) Refer to Figure 1-1 and draw a vertical line on both the center of the garage door and the wall above the door. This line should be extended up for about 1' on the wall.

( ) Refer to Figure 1-2 and find the highest point of travel of the garage door as it is opened and closed. This can be done with a carpenters level or a length of 2" x 4" board. Mark this point on the garage door vertical centerline on the wall above the door opening.

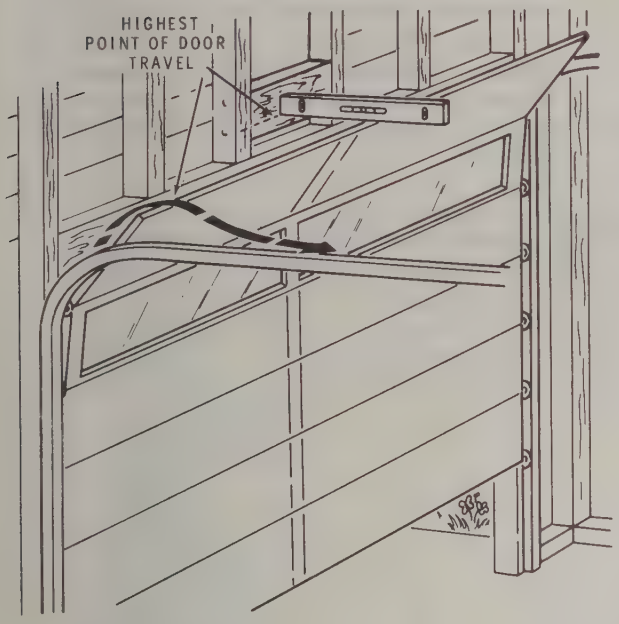


Figure 1-2

NOTE: If the interior of your garage is an uncovered frame construction, complete step 1 to provide a flat mounting surface to support the front of the Mechanism. If your garage has masonary or paneled walls, complete step 2.

( ) 1. Refer to Figure 1-3 and nail a length of 2" x 6" board between the studs. The bottom edge of this board should be 2-1/2" below the highest point of door travel. Fasten this board securely, since it must support the vertical and lateral thrust of the Mechanism.

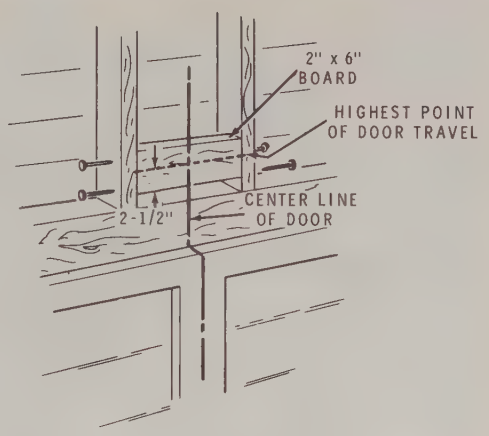


Figure 1-3

( ) 2. Fasten a length of 2" x 6" board to the wall as shown in Figure 1-4. The bottom edge of this board should be 2-1/2" below the highest point of door travel. Fasten this board securely, since it must support the vertical and lateral thrust of the Mechanism.

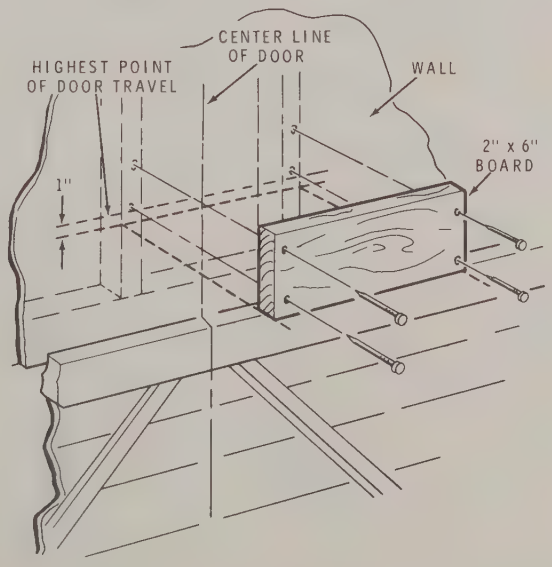


Figure 1-4

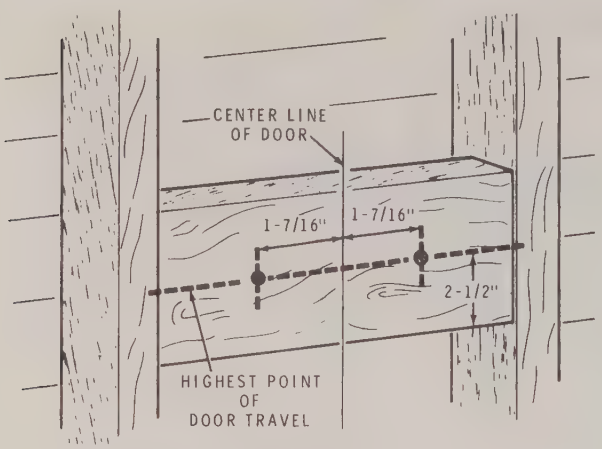


Figure 1-5

( ) Mark the locations for the two mounting holes on this board above the garage door, using the dimensions given in Figure 1-5. Predrill these holes with a #28 (9/64") drill bit.

NOTE: The assistance of another person would be helpful in performing the following steps.

( ) Refer to Figure 1-6 and set the front of the Mechanism against the mounting surface above the garage door. The chassis assembly end of the Mechanism should be supported on a 6-or 7-foot stepladder.

( ) Secure the front of the Mechanism above the garage door opening with 1/4 x 1-1/4" lag screws and 1/4" flat washers. Be sure to start the lag screws straight into the two predrilled holes. You may not be able to fully tighten the lag screws at this time because the front beam bracket may not be flat against the board. However, the lag screws should be tightened at least half-way in order to safely support the front of the Mechanism.

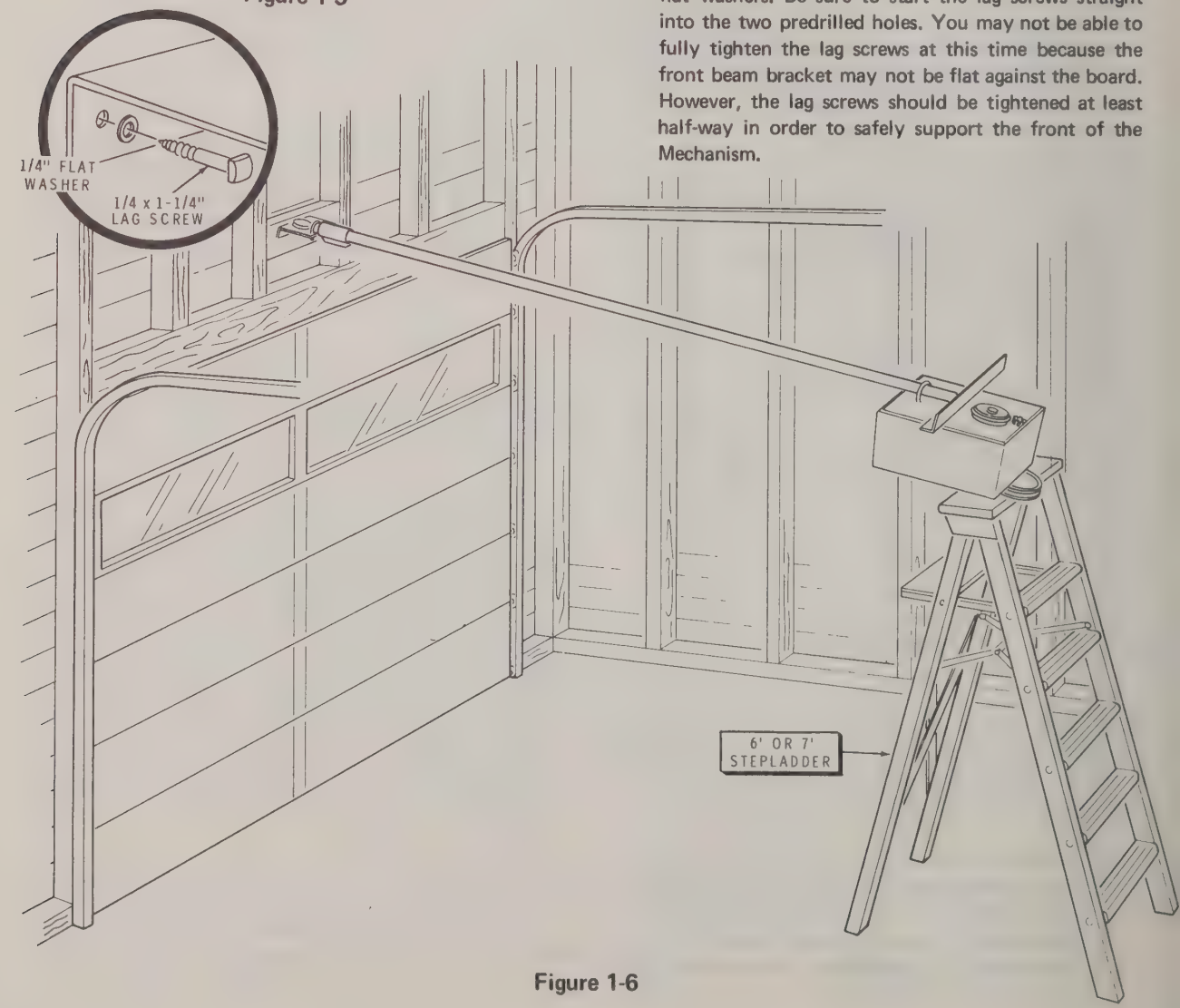


Figure 1-6

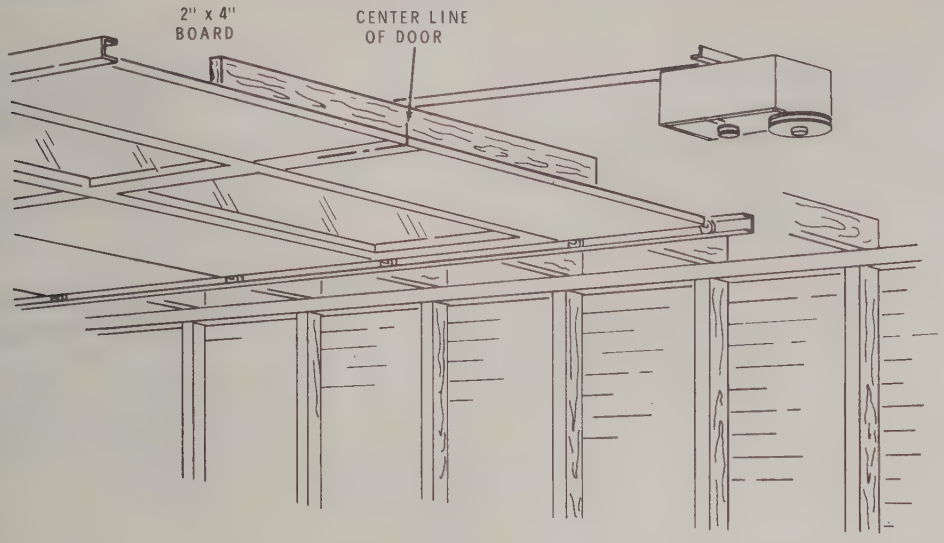


Figure 1-7

( ) Refer to Figure 1-7 and lift the chassis assembly end of the Mechanism until the beam is parallel with the floor. Then raise the garage door and place a length of 2" x 4" board between the door and the beam. Make sure the door is capable of supporting the weight of the Mechanism. It may be necessary to use a longer 2" x 4" board or support the door by some other means.

( ) With the Mechanism supported as shown in Figure 1-7, the center of the beam should be over the centerline previously marked on the top of the garage door.

( ) Make a mark on the beam even with the top edge of the fully opened door. This mark will be used as a reference later.

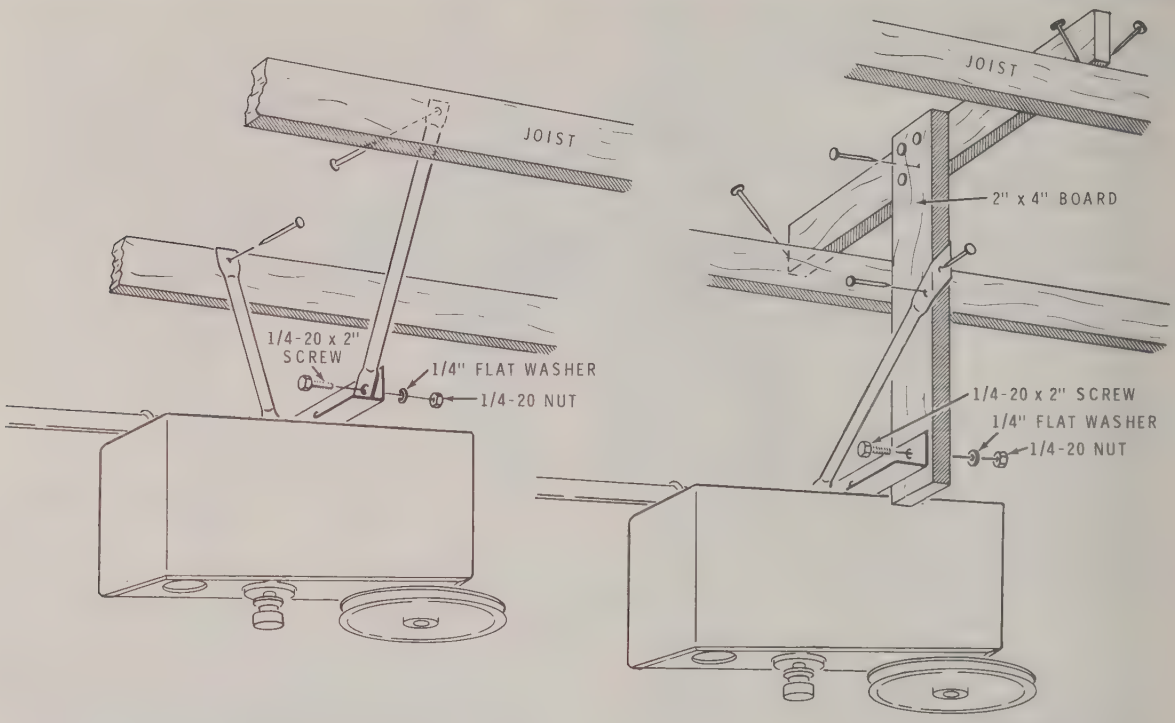

JOIST
1/4-20 x 2" SCREW
1/4" FLAT WASHER
1/4-20 NUT
JOIST
2" x 4" BOARD
1/4-20 x 2" SCREW
1/4" FLAT WASHER
1/4-20 NUT

Figure 1-8

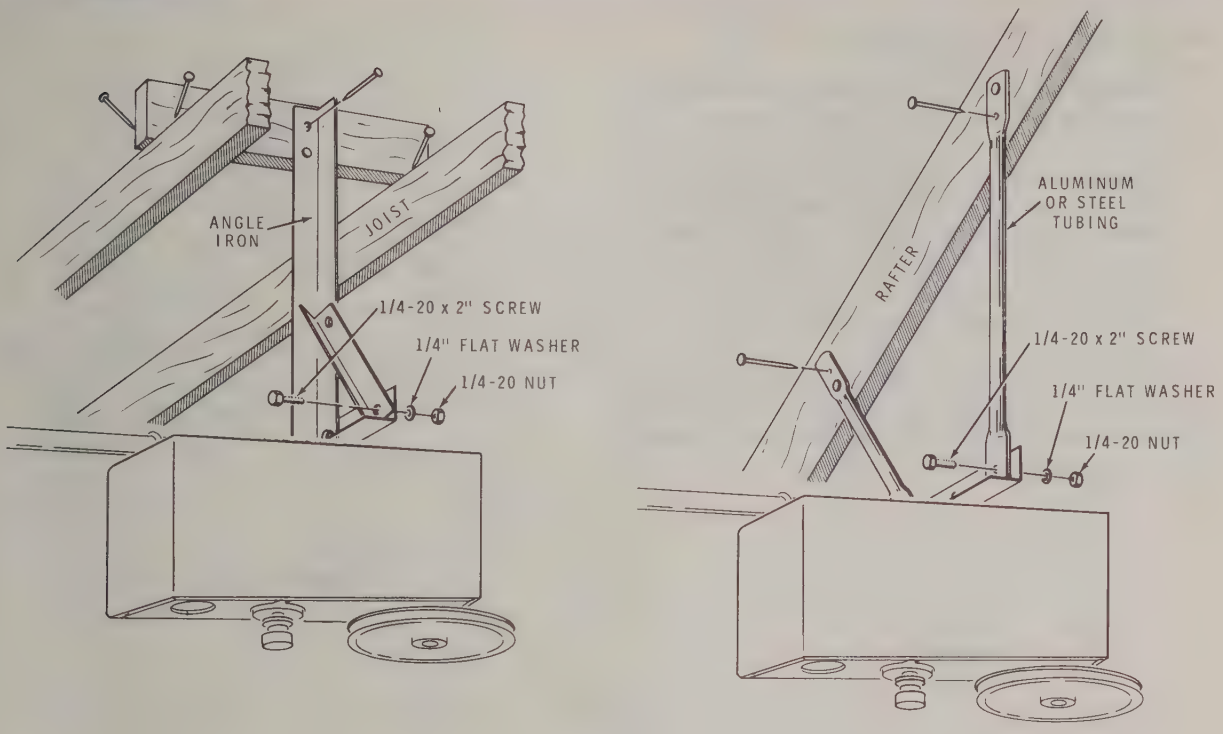


Figure 1-9

NOTE: Any of the methods shown in Figures 1-8 and 1-9 may be combined to mount the chassis assembly end of the Mechanism. If the garage has a closed ceiling, it will be necessary to cut through the ceiling material so that the chassis assembly can be fastened to the ceiling joists. The chassis assembly end of the Mechanism must be mounted with rigid enough material to hold it down as well as up. Aluminum or steel tubing with flattened ends, angle iron or 2" x 4" boards will work satisfactorily. Do not use flexible metal straps or other materials that will bend if upward pressure is applied to the underside of the chassis assembly.

( ) Mount the chassis assembly end of the Mechanism. Two 1/4-20 x 2" screws, two 1/4" flat washers, and 1/4-20 nuts have been furnished for this purpose.

( ) Now finish tightening the lag screws that secure the front beam bracket to the wall above the garage door opening.

( ) Open and close the door by hand to see that the door does not hit the beam of the Mechanism. If it does, it will be necessary to raise the chassis end of the Mechanism enough to allow the door to open without hitting the beam.

Refer to Figure 1-10 for the following steps.

( ) Extend a line from the top door roller through the door centerline previously marked on the door.

( ) Measure the distance between this line and the bottom of the beam. If you have a 7' high door and this distance exceeds 25", mark a new line on the door centerline 25" from the beam. If you have an 8' high door and this distance exceeds 17", mark a new line on the door centerline 17" from the beam.

NOTE: If your door has a brace across it at this line, mark a new line at a point that will allow you to mount the door bracket without interfering with this door brace. However, do not exceed the dimensions listed above.

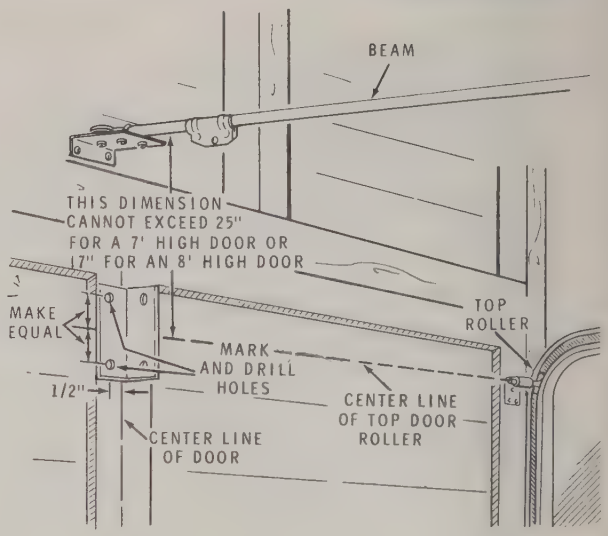

BEAM
THIS DIMENSION CANNOT EXCEED 25" FOR A 7' HIGH DOOR OR 17" FOR AN 8' HIGH DOOR
TOP ROLLER
MAKE EQUAL
MARK AND DRILL HOLES
1/2"
CENTER LINE OF TOP DOOR ROLLER
CENTER LINE OF DOOR

Figure 1-10

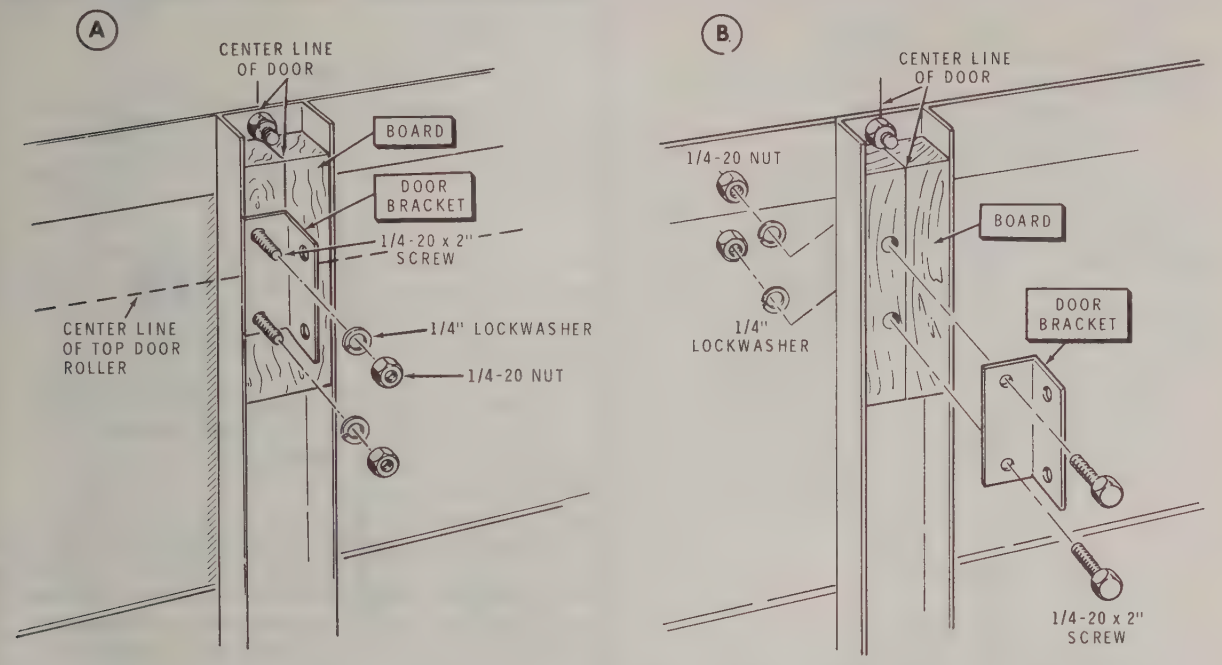


Figure 1-11

( ) Center the door bracket on this line and mark the two mounting holes as shown in Figure 1-10. Position the door bracket with its narrow side against the door. Drill 1/4" holes at these two locations. NOTE: The door bracket can be bolted directly to the metal vertical channel of some fiberglass doors. This eliminates the need for drilling holes in the fiberglass. There are two 1/4-20 x 2" screws furnished which can be used in the next step, as shown in Figure 1-11. If the screws are too long, they can be cut to the required length.

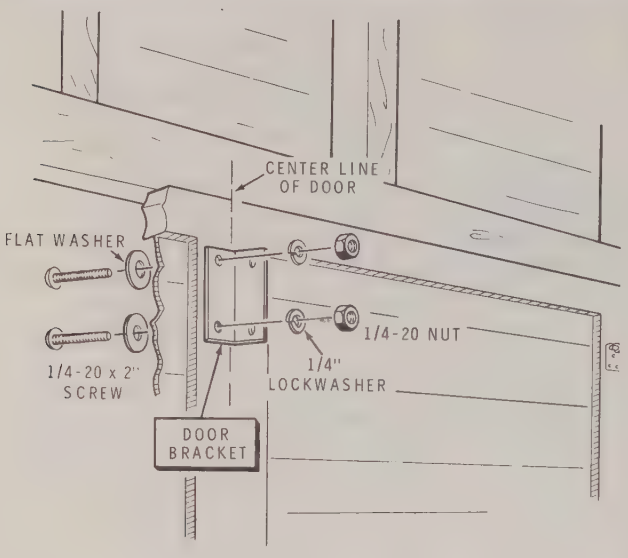


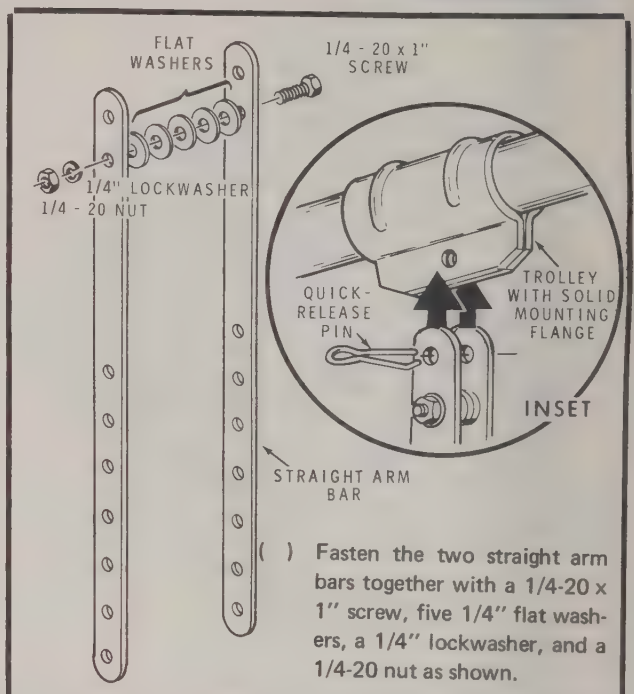
Figure 1-12

( ) Refer to Figure 1-12 and mount the door bracket. Use 1/4-20 x 2" screws, 1/4" lockwashers, flat washers (on wood doors only) and 1/4-20 nuts. Tighten this hardware until the bolt heads are pulled against the outside of the door. NOTE: It may be necessary for the heads of these screws to be flush with the outside surface of the door to clear the board at the top of the door opening on the garage. If so, countersink the screws heads as necessary.

Compare the trolley supplied with your kit with the ones shown in Figures 1-13A and 1-13B. If your trolley has a solid mounting flange, perform the steps in Figure 1-13A. If your trolley has a split mounting flange, perform the steps in Figure 1-13B. Then continue below.

NOTE: If you wish, you can tie a short length of small diameter rope to the loop of the quick-release pin for easier removal, should the occasion arise.

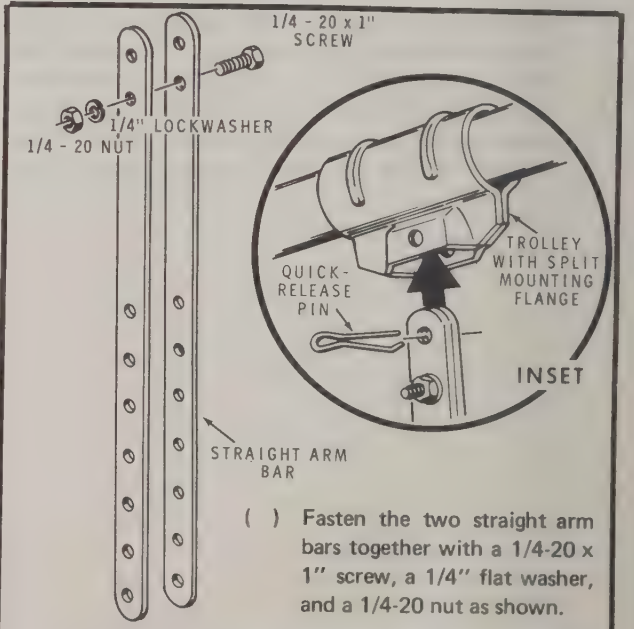
( ) Refer to Figure 1-14 and mount the indicated end of the curved arm bar to the door bracket (in either hole) with a 1/4-20 x 1" screw and a 1/4-20 locknut. Leave the nut loose enough to allow the curved arm bar to move.



( ) Fasten the two straight arm bars together with a 1/4-20 x 1" screw, five 1/4" flat washers, a 1/4" lockwasher, and a 1/4-20 nut as shown.

( ) Fasten the straight arm bar assembly to the trolley with the quick-release pin. Note the direction in which the pin is installed.

Figure 1-13A



( ) Fasten the two straight arm bars together with a 1/4-20 x 1" screw, a 1/4" flat washer, and a 1/4-20 nut as shown.

( ) Fasten the straight arm bar assembly to the trolley with the quick-release pin. Note the direction in which the pin is installed.

Figure 1-13B

( ) Fit the curved arm bar between the straight arm bars attached to the trolley as shown in Figure 1-14.

( ) Position the trolley (if necessary) on the beam, by turning the large pulley on the chassis assembly, so the straight arm bar is about 5 degrees from vertical as shown in Figure 1-14.

( ) Refer to Figure 1-15 and check to see that the two unused holes in the curved arm bar line up with two holes in the straight arm bars. If they do not, either move the curved arm bar to the other hole in the door bracket, or turn the large pulley on the chassis assembly. Be sure the angle between the straight arm bar and the door is no less than 5 degrees. NOTE: If this will not allow the holes to align with each other, refer to Figure 1-13 and install the opposite end of the straight arm bars to the trolley. Also move the hardware that fastens the straight arm bars together.

( ) Refer to the inset drawing in Figure 1-15 and mark the straight arm bars below the lower hole in the curved arm bar.

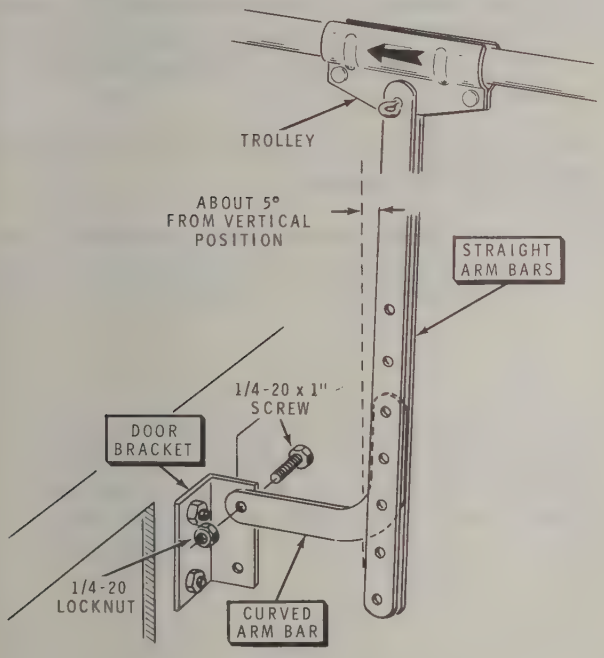


Figure 1-14

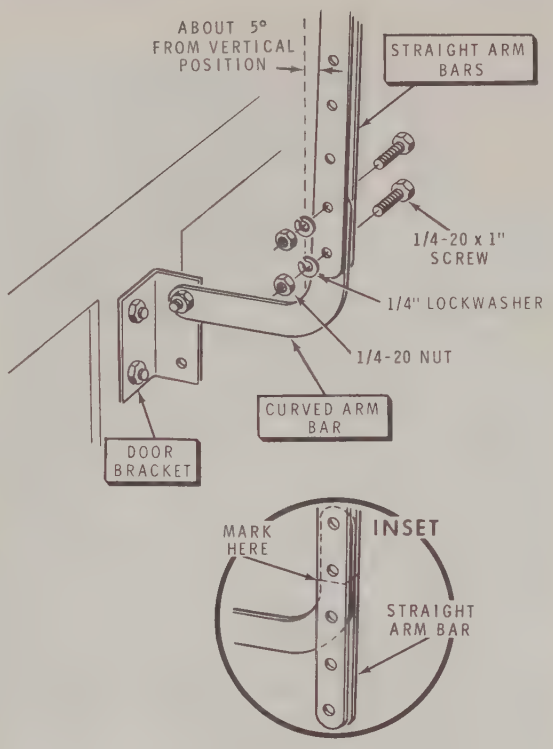


Figure 1-15

( ) Remove the straight arm bars from the trolley by removing the quick-release pin.

( ) Use a hack saw to cut off the straight arm bars on the line previously marked.

( ) Reinstall the straight arm bars on the trolley with the quick-release pin. Insert the pin from the direction shown in the inset drawing in Figure 1-13.

( ) Secure the straight arm bars to the curved arm bar with 1/4-20 x 1" hardware as shown in Figure 1-15.

This completes the installation of the Mechanism. Proceed to "Pushbutton Switch Installation" on Page 36.

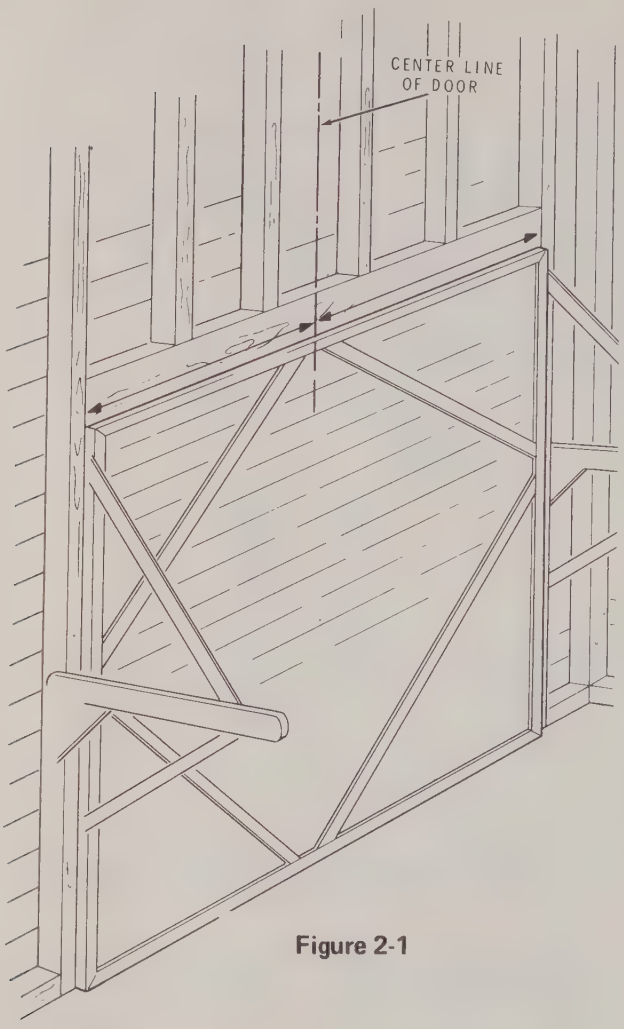


Figure 2-1

JAMB AND PIVOT-TYPE DOORS

( ) Make sure that the garage door travels freely and that the counterbalance system is adjusted properly. NOTE: The Garage Door Operator Mechanism was designed as a device to conveniently open and close your garage door; it is not intended to operate doors that are difficult to open by hand. For this reason, it is important that the door move freely as it is opened and closed.

WARNING: If it is necessary to adjust the tension of your garage door counterbalance springs for easier operation, open the door and place a stepladder or prop under the door as a safety precaution. This will keep the door from closing accidentally when the springs are adjusted and, thus, prevent possible personal injury or damage to the door.

( ) Remove any locking or latching device from your garage door before installing the Mechanism. You may either remove the locking device or secure its parts so that it will not lock the garage door closed.

( ) Refer to Figure 2-1 and draw a vertical line on both the center of the garage door and the wall above the door. This line should extend up for about 3' on the wall.

NOTE: The aid of another person will be very helpful in performing the following steps.

( ) Prop the chassis assembly end of the Mechanism up just high enough to provide head clearance and to clear the top of your car. See Figure 2-2.

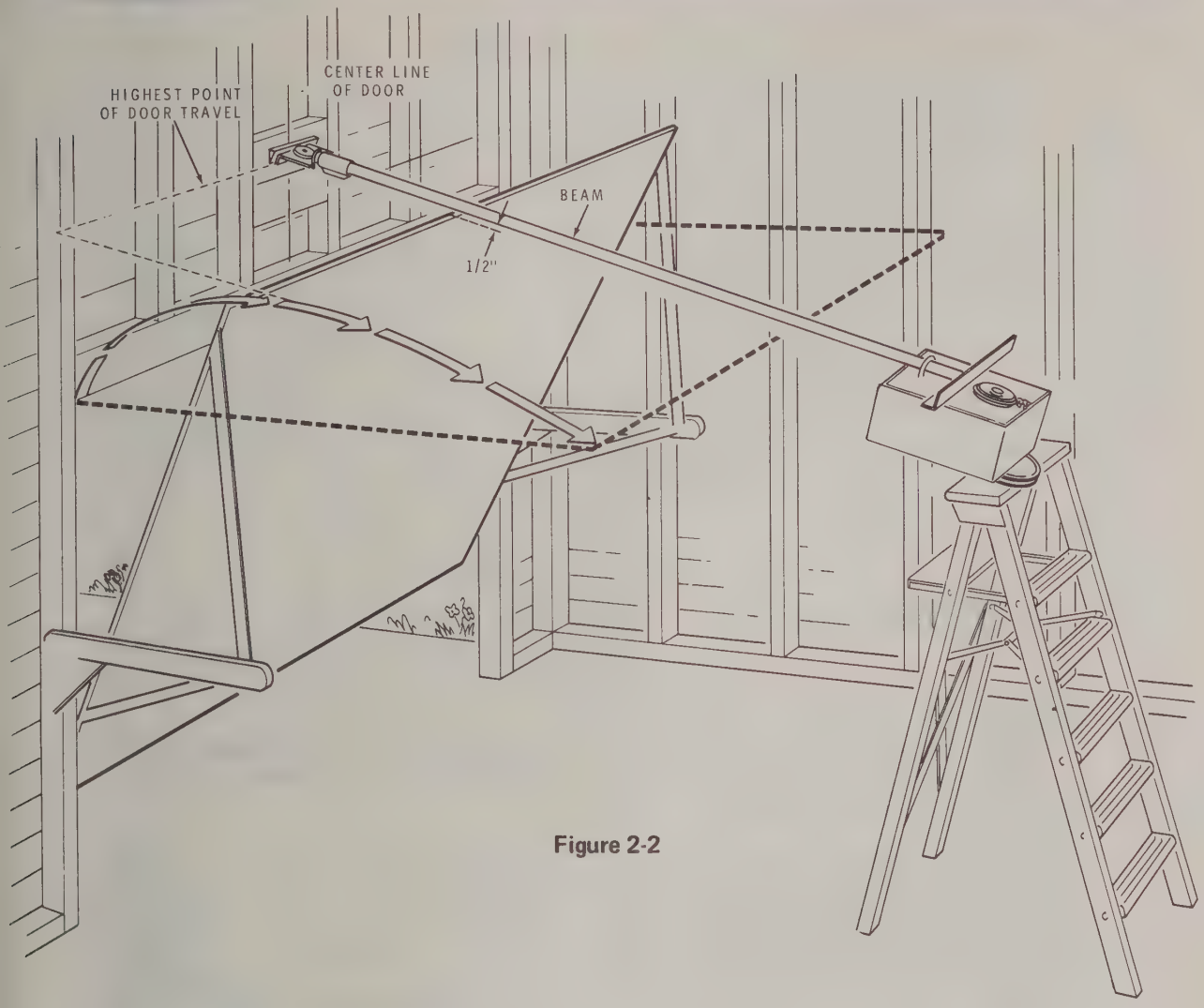


Figure 2-2

( ) Place the front end of the beam on the vertical center line and against the front of the garage. Position this end of the beam so there is about 1/2" clearance above the door at its highest point of travel as shown in Figure 2-2.

( ) Lower the door and mark a line on the wall at the lower edge of the front beam bracket on the front of the Mechanism.

( ) Place the Mechanism on the floor.

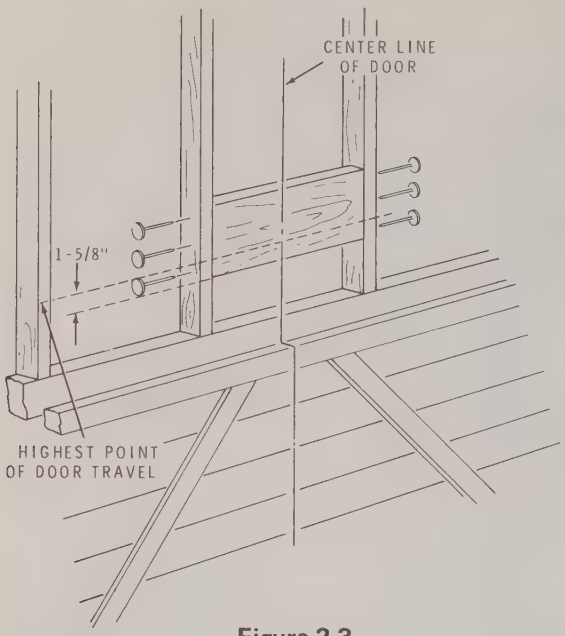


Figure 2-3

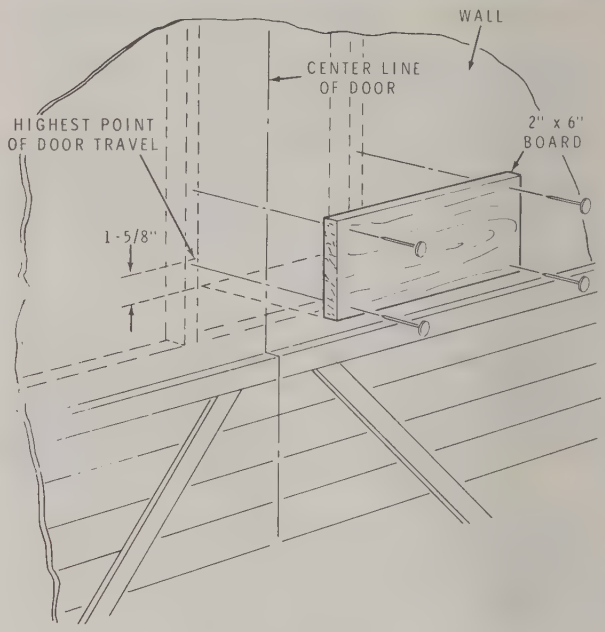


Figure 2-4

NOTE: If the interior of your garage is an uncovered frame construction, complete step 1 to provide a flat mounting surface to support the front of the Mechanism. If your garage has masonary or paneled walls, complete step 2.

( ) 1. Refer to Figure 2-3 and nail a length of 2" x 6" board between the studs. The bottom edge of this board should be 1-5/8" below the highest point of door travel. Fasten this board securely, since it must support the vertical and lateral thrust of the Mechanism.

( ) 2. Fasten a length of 2" x 6" board to the wall as shown in Figure 2-4. The bottom edge of this board should be 1-5/8" below the highest point of door travel. Fasten this board securely, since it must support the vertical and lateral thrust of the Mechanism.

( ) Mark the location of the two mounting holes on this board above the garage door, using the dimensions given in Figure 2-5. Predrill these holes with a #28 (9/64") drill bit.

( ) Position the front of the Mechanism against the board installed above the door opening.

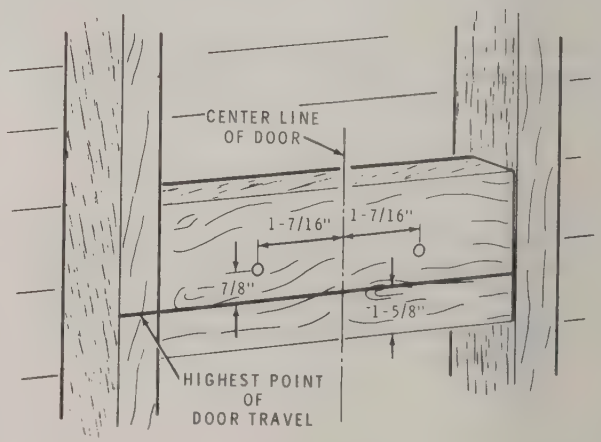


Figure 2-5

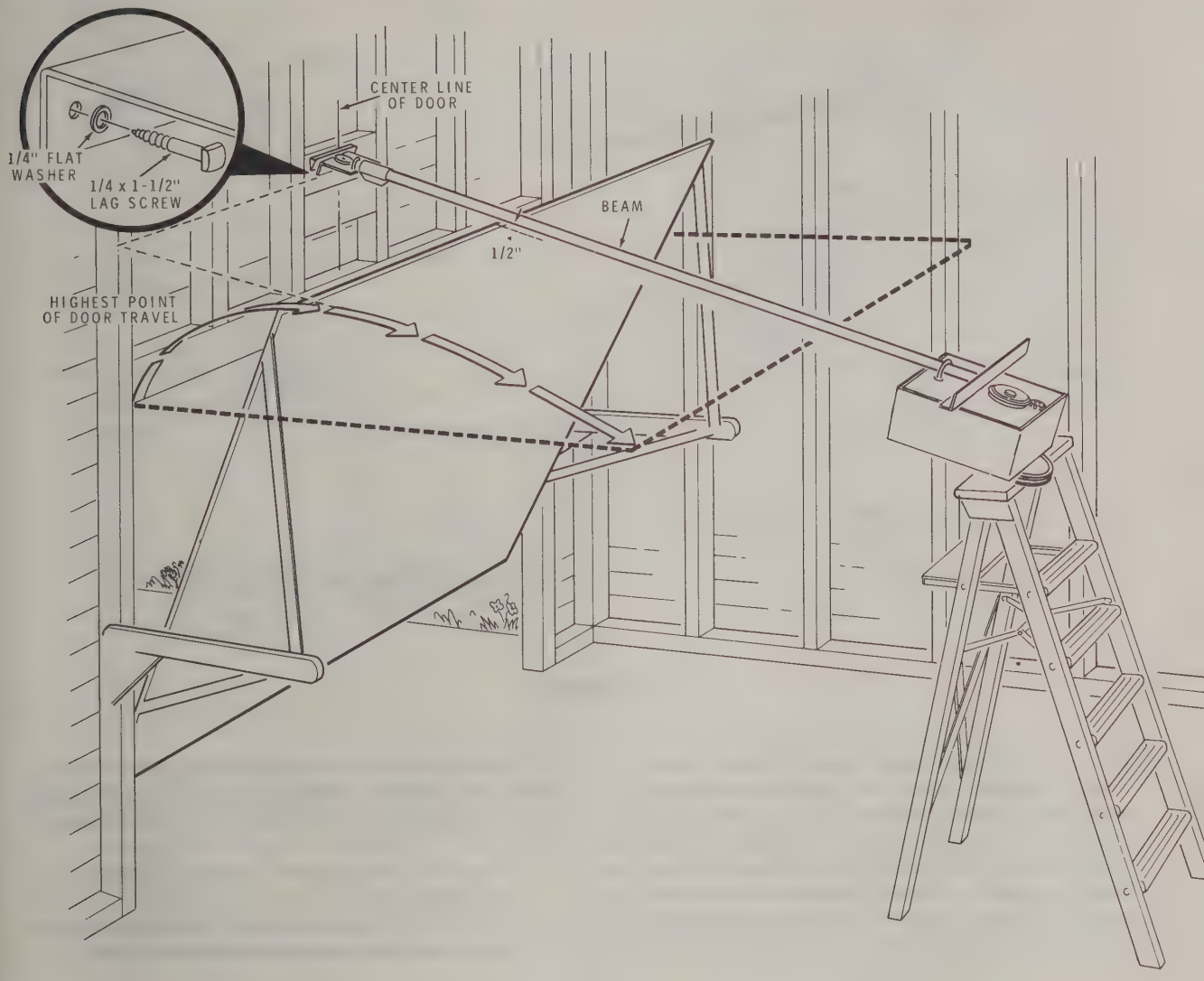


Figure 2-6

( ) Place a prop under the chassis assembly end of the Mechanism as shown in Figure 2-6. This prop should be as near the desired mounting height of the chassis assembly as possible.

( ) Secure the front of the Mechanism with 1/4 x 1-1/2" lag screws and a 1/4" flat washer. Be sure to start the lag screws straight into the two predrilled holes. Tighten the lag screws enough to hold the Mechanism securely in place, however, do not tighten them enough to bend the mounting bracket.

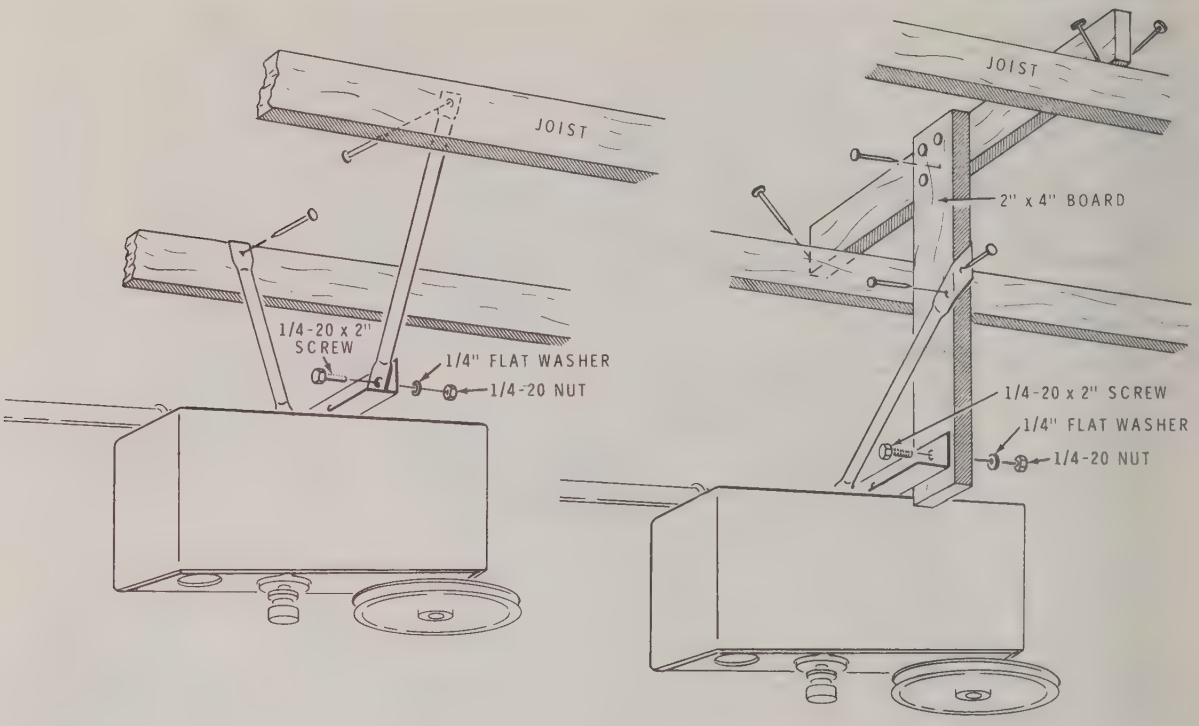


Figure 2-7

NOTE: Any of the methods shown in Figures 2-7 and 2-8 may be combined to mount the chassis assembly end of the Mechanism. If the garage has a closed ceiling, it will be necessary to cut through the ceiling material so that the chassis assembly can be fastened to the ceiling joists. The chassis assembly end of the Mechanism must be mounted with rigid enough material to hold it down as well as up. Aluminum or steel tubing with flattened ends, angle iron, or 2" x 4" boards will work satisfactorily. Do not use flexible metal straps or other materials that will bend if upward pressure is applied to the underside of the chassis assembly.

( ) Mount the chassis assembly end of the Mechanism at the height determined earlier. Two 1/4-20 x 2" screws, two 1/4" flat washers, two 1/4" lockwashers, and two 1/4-20 nuts have been furnished for this purpose.

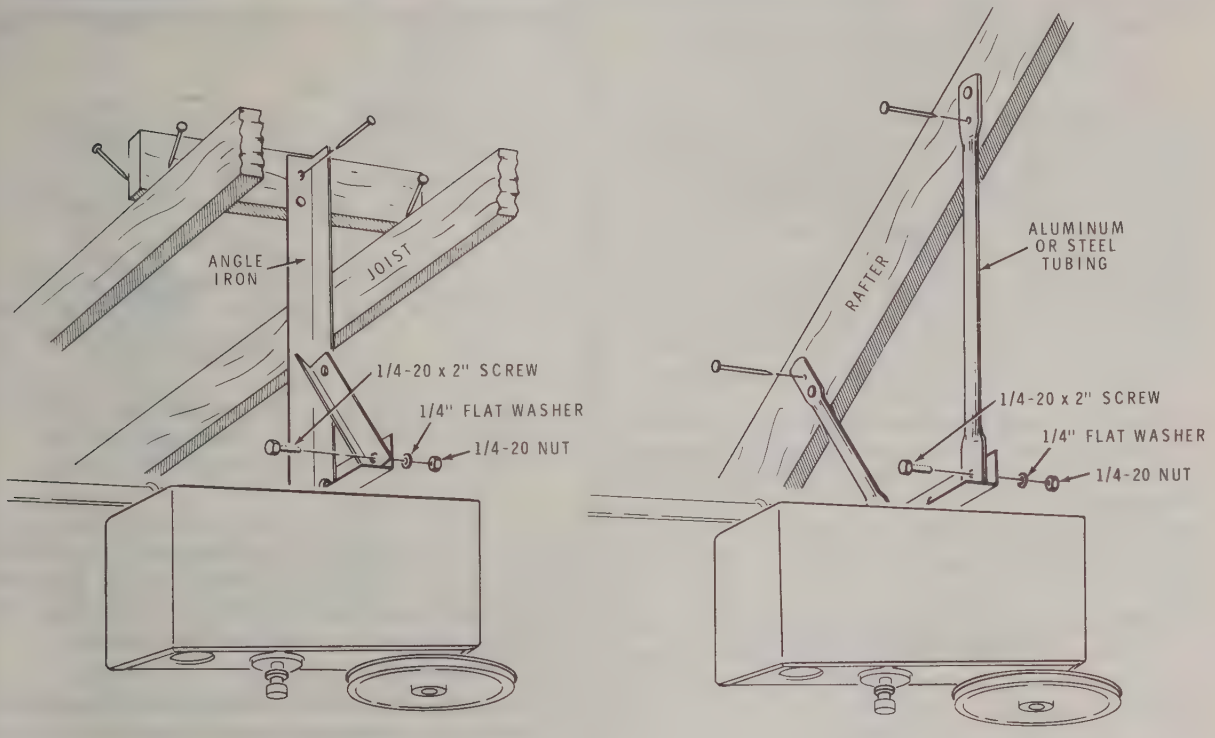


Figure 2-8

( ) After the Mechanism has been secured, remove the prop from under the chassis assembly end of the Mechanism. Open and close the door to be sure the top of the door clears the beam by 1/2" at the highest point of door travel.

( ) Finish tightening the lag screws that secure the front beam bracket to the wall above the garage door opening. Do not tighten the screws so much that they bend the bracket. NOTE: If the mounting bracket meets the garage wall at a large angle, it would be best to install a taper-cut block between the mounting bracket and the wall. This would provide a flush fit and prevent bending the bracket or beam when the lag screws are tightened.

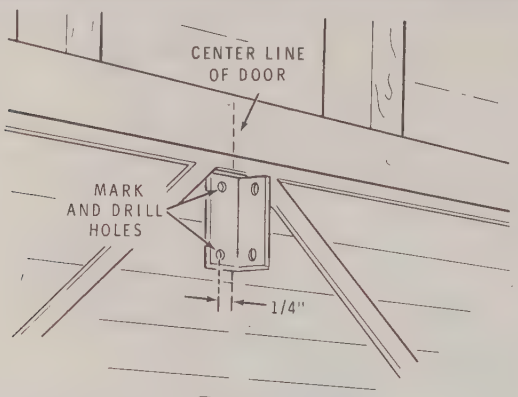


Figure 2-9

( ) Refer to Figure 2-9 and mark the locations for the two mounting holes for the door bracket on the garage door. Position the narrow side of the bracket against the door.

( ) Drill 1/4" holes at these two locations.

( ) Refer to Figure 2-10 and mount the door bracket. Use 1/4-20 x 2" hardware. Tighten this hardware until the screw heads are pulled against the outside of the door.

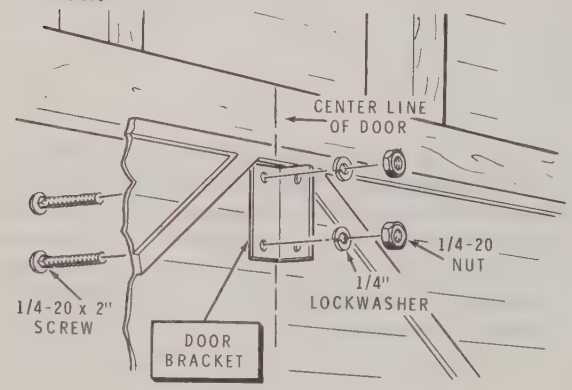


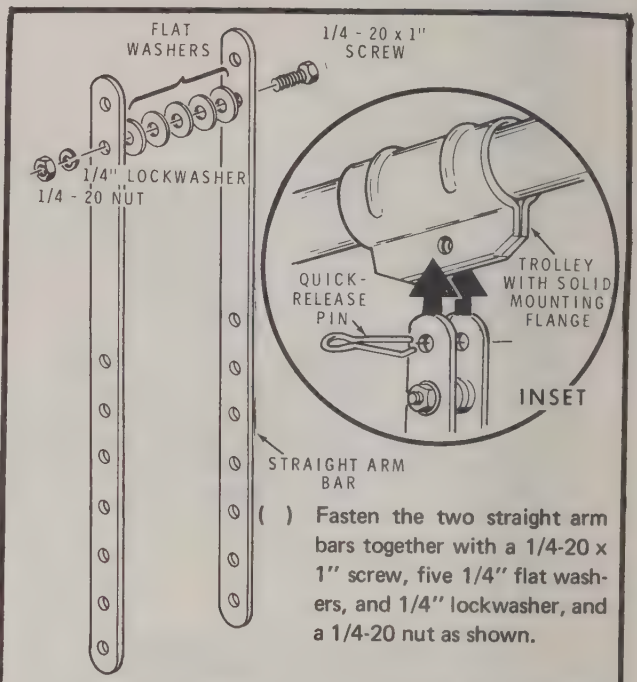
Figure 2-10

( ) Unpack the Model GDA-309-2 arm extension kit. NOTE: Some of the parts and hardware used in the following steps are furnished with the Mechanism.

Compare the trolley supplied with your kit with the ones shown in Figures 2-11A and 2-11B. If your trolley has a solid mounting flange, perform the steps in Figure 2-11A. If your trolley has a split mounting flange, perform the steps in Figure 2-11B. Then continue below.

( ) Turn the large pulley on the chassis assembly until the trolley is 6" in front of the chassis assembly.

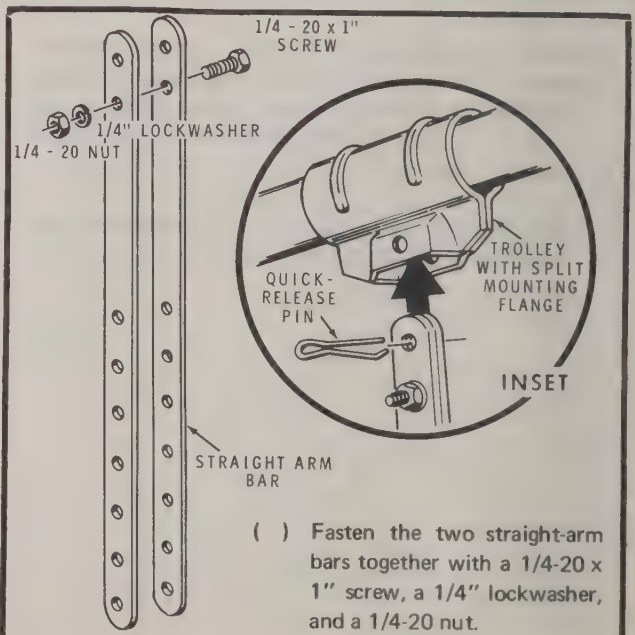
NOTE: If you wish, you can sit a short length of small diameter rope to the loop of the quick release pin for easier removal, should the occasion arise.



( ) Fasten the two straight arm bars together with a 1/4-20 x 1" screw, five 1/4" flat washers, and 1/4" lockwasher, and a 1/4-20 nut as shown.

( ) Fasten the straight arm bar assembly to the trolley with the quick-release pin. Note the direction in which the pin is installed.

Figure 2-11A



( ) Fasten the two straight-arm bars together with a 1/4-20 x 1" screw, a 1/4" lockwasher, and a 1/4-20 nut.

( ) Fasten the straight arm bar assembly to the trolley with the quick-release pin. Note the direction in which the pin is installed.

Figure 2-11B

Refer to Figure 2-12 (fold-out from Page 37) for the following steps.

( ) Secure the end of the curved arm bar with the single hole to either hole in the door bracket with a 1/4-20 x 1" screw and a 1/4-20 locknut. Leave the nut loose enough to allow the bar to move.

( ) Mount the indicated end of a straight arm bar to the curved arm bar on the door with 1/4-20 x 1" hardware.

( ) Open the door to its fully opened position. Make a mark on the beam even with the top edge of the door. This is a reference mark which will be used later.

( ) Position the free end of the straight arm bar from the door between the free ends of the straight arm bars from the trolley. Check to see that two holes of each of these straight arm bars are aligned with each other. If they are not, either move the curved arm bar at the door to the other hole in the door bracket, or turn the large pulley on the chassis assembly.

( ) Now secure these bars together with 1/4-20 x 1" hardware in both holes.

CAUTION: The door bracket must be above a line between the trolley and the center of the pivot as shown in Figure 2-13. If the door bracket is below this line, the door will be pushed downward instead of forward when the door is closed; thus the door or Mechanism will be damaged. If the door bracket is below this line, the chassis assembly end of the Mechanism must be lowered. If this is the case, then the front of the Mechanism must be raised to maintain a 1/2" clearance between the top of the door, when it is at its highest point of travel, and the beam of the Mechanism.

( ) Turn the large pulley on the chassis assembly by hand to close the door. If the door does not go fully closed, remove the hardware holding the straight arm bars together and close the door. Reassemble the straight arm bars. If necessary, use the other hole in the door bracket, or turn the large pulley of the Mechanism to line up the holes in the straight arm bars.

This completes the installation of the Mechanism. Proceed to "Pushbutton Switch Installation."

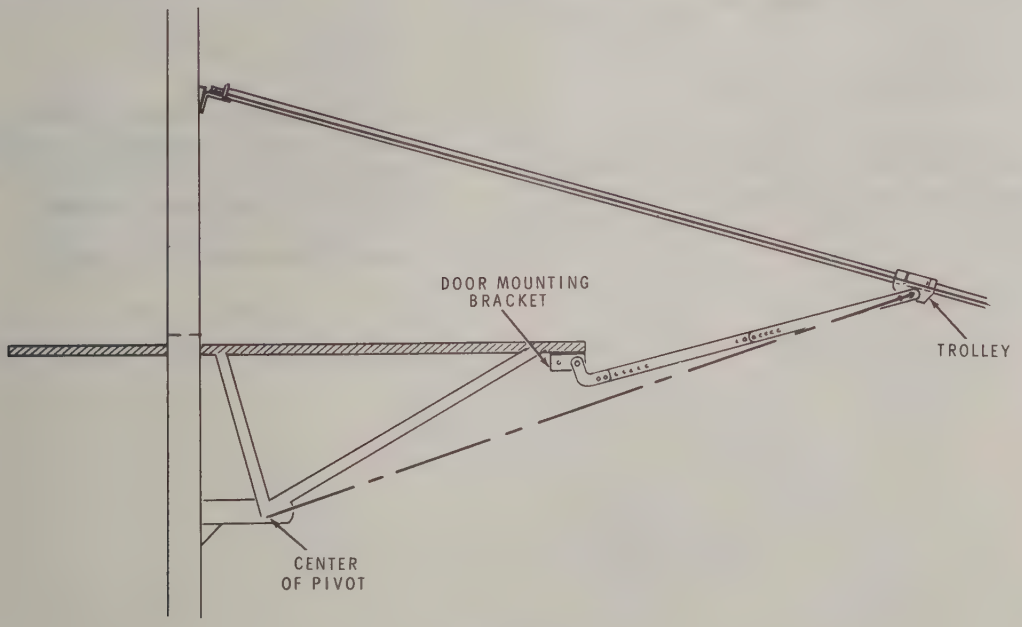


Figure 2-13

PUSHBUTTON SWITCH INSTALLATION

The doorbell-type pushbutton switch and its wiring will be installed in the following steps. The switch is used to operate the Mechanism from inside the garage. For safety, the pushbutton should be positioned above the reach of small children. Therefore, decide on the best location for this switch in your garage, and proceed with the installation.

NOTE: There is 20 feet of 2-wire twisted cable furnished for the installation of the pushbutton. If the cable is too long, the excess may be cut off, or coiled up in case the pushbutton is moved to another location in the future. If the cable is too short to reach the selected pushbutton location, you may splice on an additional length of 2-wire cable. The additional length of cable (doorbell wire) can be obtained from a local source.

( ) Remove 1/2" of insulation from each wire at both ends of the cable.

( ) Connect either wire at one end of the cable under either screw of the pushbutton switch. Connect the remaining wire under the other screw of the pushbutton switch. See Figure 3-1.

( ) Mount the pushbutton switch with the two screws packed with it.

Refer to Figure 3-2 for the following steps.

( ) Route the cable to the chassis assembly end of the Mechanism. Use thumbtacks or small staples to anchor the cable as necessary. Be careful not to flatten the insulation, as this could cause the wires to short circuit.

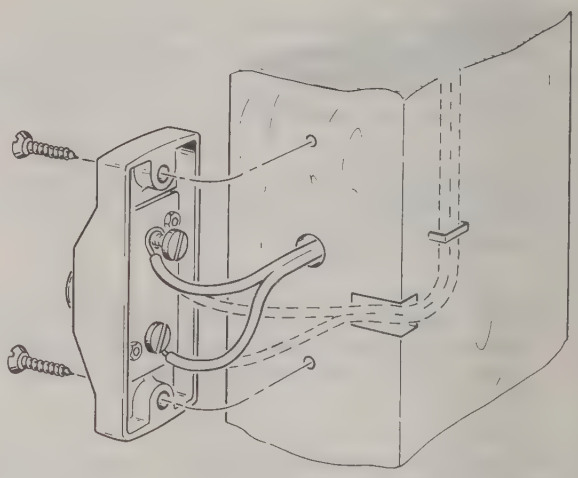


Figure 3-1

( ) Connect either wire at the free end of the cable, under one of the screws of the control terminals of the Mechanism. Connect the other wire under the remaining screw on the control terminals.

This completes the installation of the Pushbutton.

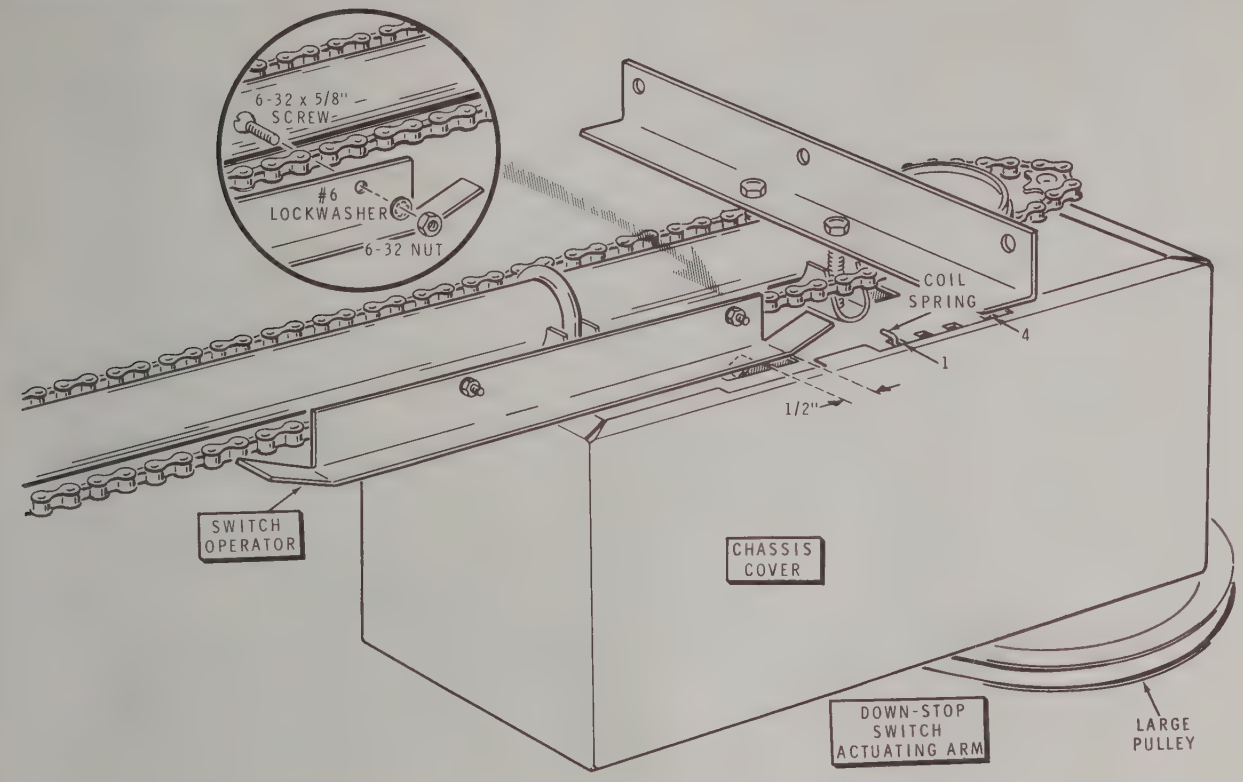


Figure 4-1

ADJUSTMENTS

CHAIN ADJUSTMENT

WARNING: Do not plug the line cord of the Mechanism into an ac outlet until specifically instructed to do so in a step.

Refer to Figure 4-1 for the following steps.

NOTE: Before performing the next step, check to see that the chain is still positioned properly on both idler wheels and the sprocket.

( ) Move the coil spring from notch #4 to notch #1. Move the chassis cover only enough to move the spring. Then push the chassis cover back in place on the chassis.

( ) Adjust the tightening nut on the adjusting screw of the trolley so that the bottom of the chain is even with the bottom edge of the beam at the center of the beam, as shown in Figure 4-2.

( ) Now tighten the locking nut of the adjusting screw. This will keep the end nut from loosening due to vibration of the Mechanism and prevent the chain from twisting.

( ) Turn the large pulley on the Mechanism by hand until the bottom of the door is opened approximately 6" from the floor.

( ) Mount a switch operator on the chain with 6-32 x 5/8" hardware. Position the switch operator so its indicated end is 1/2" from the bend in the actuating arm of the down-stop switch.

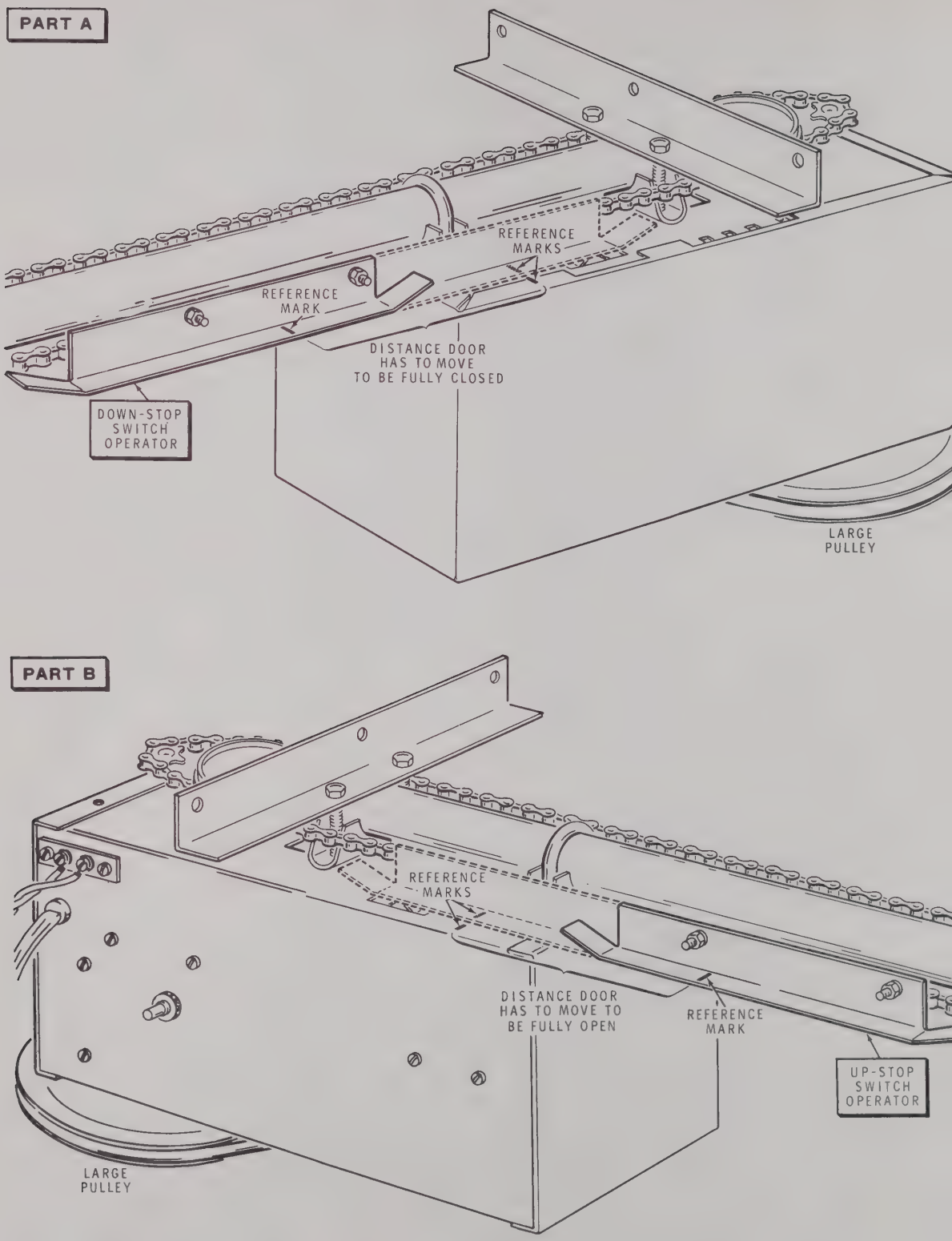

PART A
REFERENCE MARKS
REFERENCE MARK
DISTANCE DOOR HAS TO MOVE TO BE FULLY CLOSED
DOWN-STOP SWITCH OPERATOR
LARGE PULLEY
PART B
REFERENCE MARKS
DISTANCE DOOR HAS TO MOVE TO BE FULLY OPEN
REFERENCE MARK
UP-STOP SWITCH OPERATOR
LARGE PULLEY

Figure 4-4

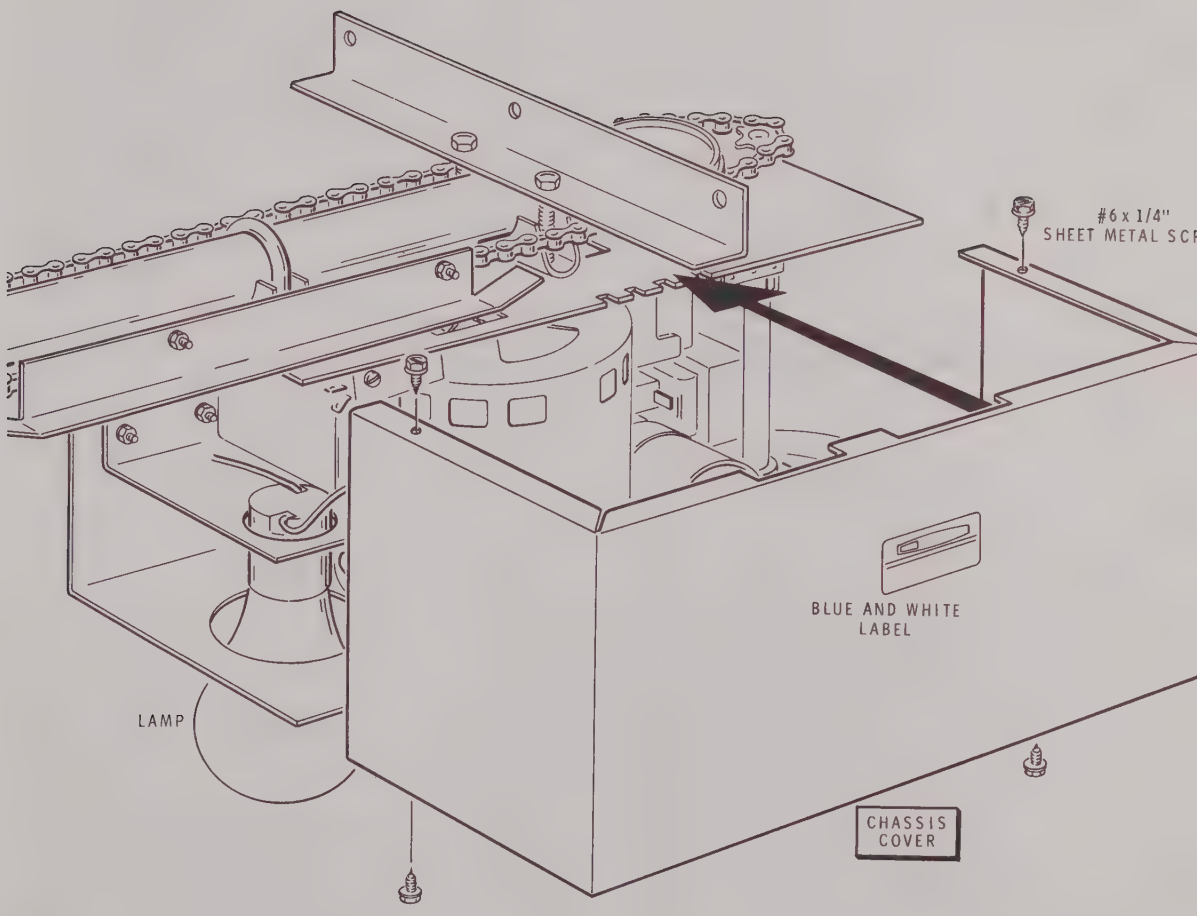

#6 x 1/4"
SHEET METAL SCR
BLUE AND WHITE
LABEL
LAMP
CHASSIS
COVER

Figure 4-6

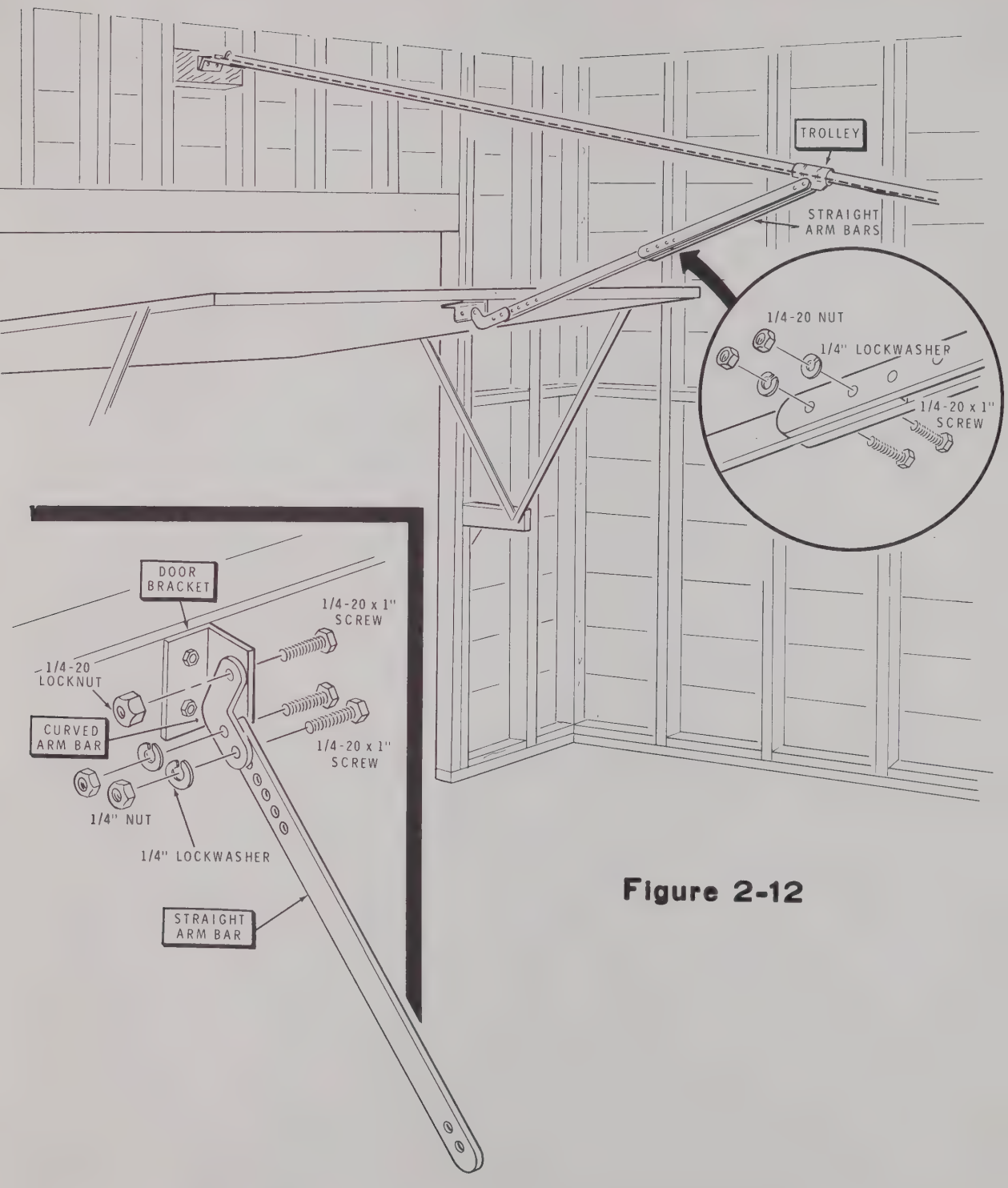

TROLLEY
STRAIGHT ARM BARS
1/4-20 NUT
1/4" LOCKWASHER
1/4-20 x 1" SCREW
DOOR BRACKET
1/4-20 x 1" SCREW
1/4-20 LOCKNUT
CURVED ARM BAR
1/4-20 x 1" SCREW
1/4" NUT
1/4" LOCKWASHER
STRAIGHT ARM BAR

Figure 2-12

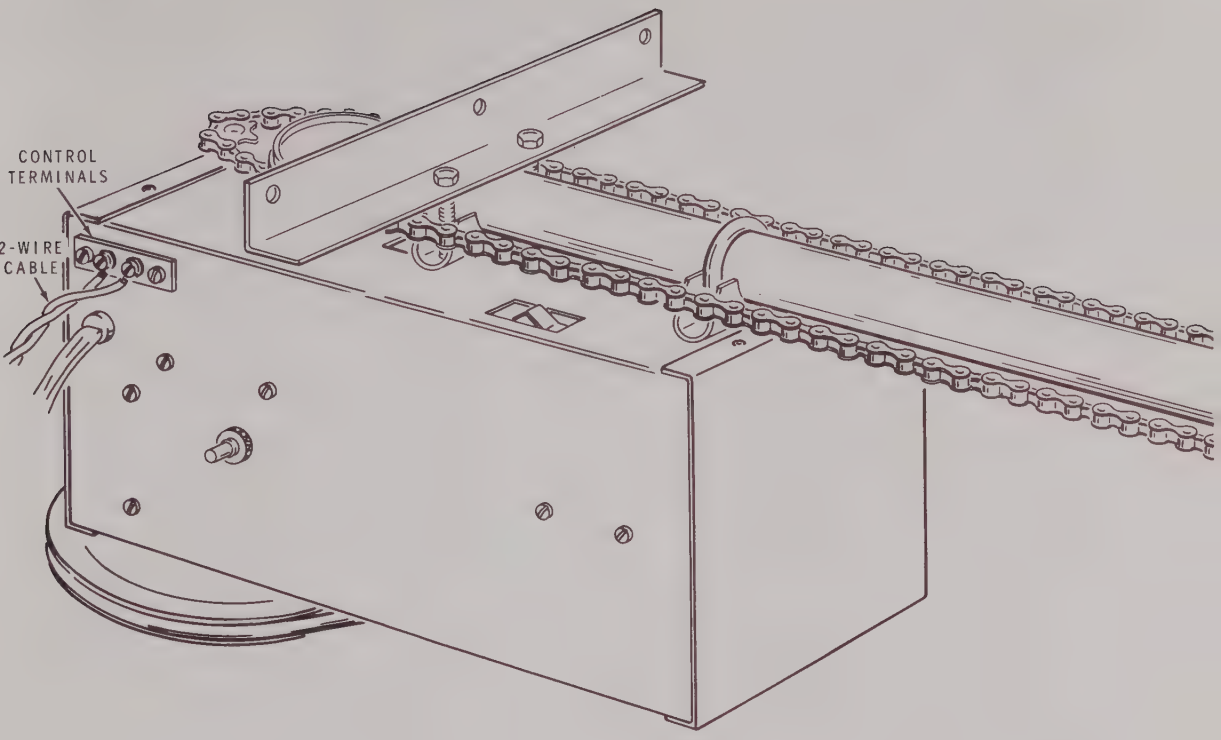


Figure 3-2

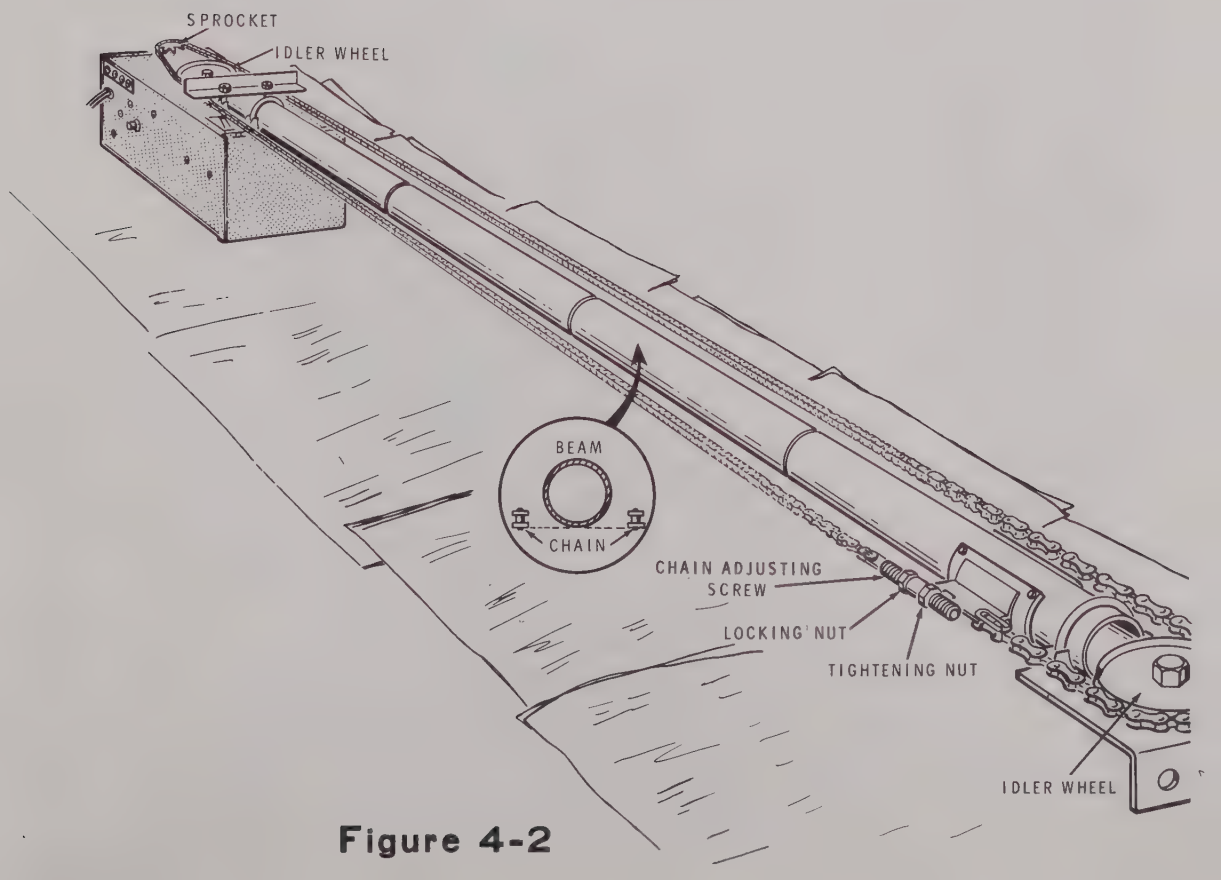


Figure 4-2

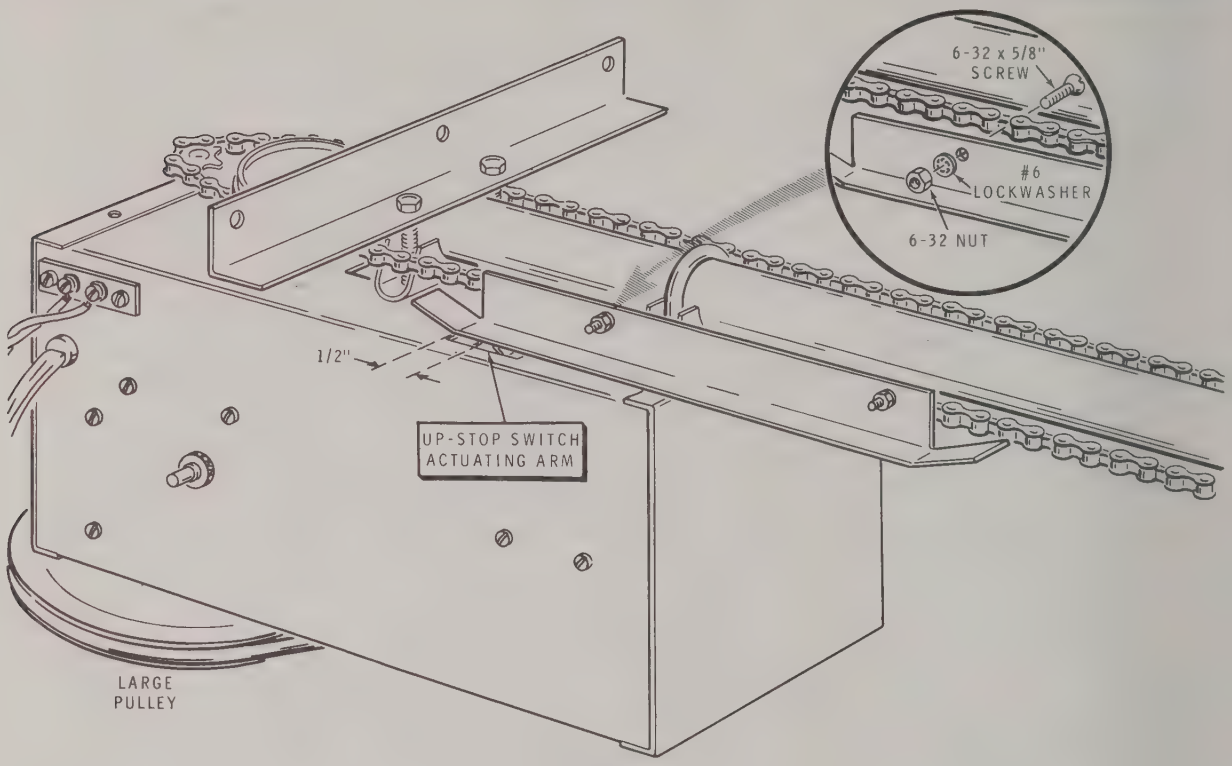


Figure 4-3

Refer to Figure 4-3 for the following steps.

( ) Turn the large pulley of the Mechanism by hand until the door is 6" forward of the fully opened reference mark on the beam.

( ) Mount a switch operator on the chain with 6-32 x 5/8" hardware. Position the switch operator so its indicated end is 1/2" from the bend in the actuating arm of the up-stop switch.

DOWN-STOP ADJUSTMENT

Refer to Figure 4-4 (fold-out from this page) for the following steps.

In the following steps the switch operators will be repositioned to make the door go fully closed and fully open. The switch operators are now positioned so the door should stop short of its fully open of fully closed position. However, all doors have a tendency to coast after the Mechanism turns off. This is most critical in the closing direction. Therefore, the down-stop switch should be made to turn off so that the door will coast to its just-closed position. If the door is closed with too much down force, any build up of snow could cause the door to reverse to its open position, making it impossible to get the door to stay closed under such conditions. Keep this in mind when making the following adjustment. Remember that the automatic reversing feature (red wire disconnected from lug 3 of microswitch H) is disabled at the present time.

( ) Plug the line cord of the Mechanism into a 120 Vac outlet. NOTE: It is suggested that you plug the Mechanism line cord into an extension cord. Position the extension cord within reach when making the adjustments so you can unplug the Mechanism quickly in case of an emergency.

WARNING: <u>Do not</u> remove and reposition the switch operators without first disconnecting the line cord from the ac outlet. Any movement of the switch operator at the chassis assembly end of the Mechanism could allow the switch to actuate; thus allowing the Mechanism to turn on, which could cause serious personal injury or damage to the Mechanism or door.

( ) Press the pushbutton switch to actuate the Mechanism. The door should start to close and then stop somewhere within the last 6" of travel.

( ) Unplug the Mechanism line cord.

( ) Make a reference mark on the down-stop switch operator and the top of the chassis. See the part A of Figure 4-4.

( ) Measure the distance between the bottom edge of the door and the floor.

( ) Remove the hardware from the down-stop switch operator. Move the down-stop switch operator towards the door a distance equal to the amount the door must travel to be fully closed.

( ) Reinstall the down-stop switch operator on the chain at this new location.

WARNING: When performing the next step, the door will close further by itself if the down-stop switch operator was moved off the actuator of the down-stop microswitch in the previous step.

( ) Reconnect the line cord. Press the pushbutton to open the door. When the door stops, press the pushbutton again to close the door.

( ) Unplug the Mechanism line cord.

( ) Now check to see that the door is fully closed. If not, move the down-stop switch operator as required. Move the down-stop switch operator the same direction and distance the door has to move to be fully closed.

( ) Repeat the previous two steps as many times as necessary to get the door to close fully. Always unplug the line cord when making an adjustment.

UP-STOP ADJUSTMENT

( ) Press the pushbutton switch to raise the door. The door should stop somewhere within the last 6" of travel.

( ) Unplug the Mechanism line cord.

( ) Make a reference mark on the up-stop switch operator and the top of the chassis as shown in part B of Figure 4-4.

( ) Measure the distance between the top of the door and the mark on the beam that indicates the fully open position of the door.

( ) Remove the hardware from the up-stop switch operator. Move the up-stop switch operator towards the door a distance equal to the amount the door must move to be fully opened. See part B of Figure 4-4.

( ) Reinstall the up-stop switch operator at this new location on the chain. NOTE: It was probably necessary to reposition the down-stop switch operator a number of times, as the trolley had to move further than the door traveled because of the angle of the arm bar with the door. This is not the case with the up-stop switch operator. Do not over allow the distance the door has to travel before being opened fully.

WARNING: When performing the next step, the door will open further by itself if the up-stop switch operator was moved off the actuator of the up-stop microswitch in the previous step.

( ) Reconnect the line cord and press the pushbutton. When the door stops, press the pushbutton once again to open the door.

( ) Unplug the Mechanism line cord.

( ) Now check to see that the door is fully opened. If not, move the up-stop switch operator as required (towards the door to open it further or away from the door to prevent it from opening too far). Move the operator the same distance the door has to move to be fully opened.

( ) Repeat the previous two steps as many times as necessary to get the door to open fully. Always unplug the line cord when making an adjustment.

( ) Press the pushbutton, if necessary, to move the door to its open position. Then proceed to "Automatic Reversing Adjustment."

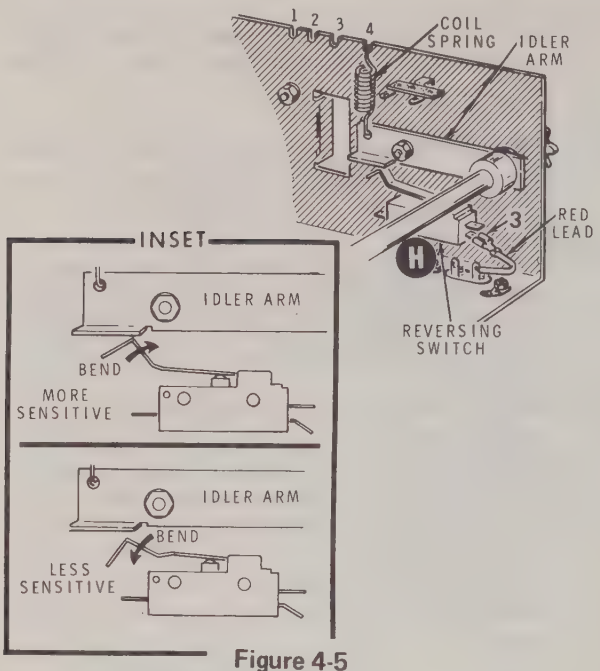


Figure 4-5

AUTOMATIC REVERSING ADJUSTMENT

( ) Unplug the Mechanism line cord from the ac outlet.

( ) Remove the chassis cover from the chassis.

( ) Remove the tape from the connector of the red wire and push the connector onto lug 3 of microswitch H. See Figure 4-5.

NOTE: The automatic reversing feature of the Mechanism causes the door to return to its open position when something interferes with the downward travel of the door. Therefore, make the following adjustments carefully to take full advantage of this very important safety feature. It is desirable that the automatic reversing be set as sensitive as possible, but still allow the door to operate properly under normal conditions. The sensitiveness of this adjustment will depend on the amount of force required to close the garage door. Therefore, it is essential that the door operate smoothly as described in the "Installation Considerations" (Page 18) section of the Manual.

There are three things that affect the operation of the automatic reversing feature; the tension of the chain, the position of the coil spring, and the shape of the reversing microswitch actuating arm. Since each door has different closing requirements, it is necessary to perform these three adjustments on a trial-and-error basis as described in the following step.

WARNING: Do not change the chain adjustment, spring location or rebend the actuating arm of the reversing switch without first disconnecting the line cord of the Mechanism to prevent personal injury.

Refer to Figure 4-5 for the following step.

( ) Unplug the line cord and move the coil spring to notch #4. Then reconnect the line cord.

COIL SPRING ADJUSTMENT

The object of the next step is to position the coil spring in the highest numbered notch (lowest spring tension) that will allow the door to close without reversing. If the door reverses during the closing cycle, unplug the line cord, move the spring to the next lower numbered notch in the chassis and reconnect the line cord. Then try closing the door again. Repeat this operation as many times as necessary until the door closes without reversing. NOTE: THE FOLLOWING ADJUSTMENTS ARE CRITICAL AND THE RESULTS WILL BE DIFFERENT, DEPENDING WHETHER THE CHASSIS COVER IS ON OR OFF THE CHASSIS. FOR THIS REASON, THE CHASSIS COVER MUST BE PUSHED PART WAY (ONE TO TWO INCHES) ONTO THE CHASSIS AFTER EACH ADJUSTMENT AND BEFORE THE MECHANISM IS OPERATED.

( ) Plug the line cord of the Mechanism into an ac outlet.

( ) Press the pushbutton to close the door, and, if necessary, move the coil spring as described above. If a spring position is found that will allow the door to close without reversing, skip the next two steps and proceed with the "Reversing Switch Adjustment." If the spring is moved to notch #1 and the door still reverses, perform the next two steps.

( ) Unplug the line cord. Install one end of the second coil spring in the same hole with the other coil spring on the idler arm. Bend this end of the spring closed as much as possible. Connect the other ends of both coil springs in notch 4 of the chassis. Then reconnect the line cord and press the pushbutton to close the door. If the door does not remain closed, move one coil spring to notch 3 of the chassis and try closing the door once again. Repeat this procedure as many times as necessary, moving one or both coil springs to a lower number notch in the chassis, until the door will remain closed. If a spring position is found that allows the door to remain closed, skip the next step and proceed to "Reversing Switch Adjustment."

( ) If the door reverses automatically with both coil springs in notch #1, it is necessary to tighten the chain slightly. This is done as follows:

1. Unplug the line cord.
2. Loosen the locking nut on the adjusting screw of the trolley. See Figure 4-1 (fold-out from Page 36).
3. Tighten the tightening nut 1/6 turn (1 flat of the nut).
4. Retighten the locking nut.
5. Reconnect the line cord.
6. Push the pushbutton to close the door. Repeat the preceding numbered steps as many times as necessary to get the door to close without reversing. Tighten the tightening nut only 1/6 turn at a time.

CAUTION: Do not tighten the tightening nut more than six 1/6-turns (one complete turn of the nut), otherwise the chain will be too tight and could cause too much drag on the motor.

REVERSING SWITCH ADJUSTMENT

In the following steps the Mechanism will be checked for the amount of force necessary to reverse the door. This can be done by starting the door in its downward direction, and then placing your hand under the bottom of the door when the door travels to a position equal to the height of a car roof. Without too much upward effort applied to the bottom of the door, the door should reverse and stop at its fully open position. If you feel the downward force is so great it could damage a car or hurt a small child, the reversing action can be made more sensitive by bending the actuating arm of the reversing switch toward the reversing lever in the Mechanism. The switch actuating arm should be bent a very small amount at a time and the door should be tested again. Repeat this procedure as many times as necessary until the desired reversing force is obtained. However, bending the switch actuating arm too much will cause the door to reverse automatically when traveling in the downward direction.

WARNING: Remember to unplug the line cord each time you make an adjustment and replace the chassis cover before retesting the door.

( ) Press the pushbutton to start the door closing. Place your hand under the door to see how much force is required to reverse the door. If necessary, bend the actuating arm towards the reversing lever a very small amount. See Figure 4-5.

This completes the adjustments of the Mechanism. Operate it several times to be sure it is working properly.

FINAL ASSEMBLY

( ) Apply a couple drops of lightweight machine oil to the two bearings in the chassis assembly.

( ) Refer to Figure 4-6 and install the chassis cover on the chassis with #6 x 1/4" sheet metal screws.

NOTE: The blue and white label that is installed in the next step shows the Model number and Production Series number of your kit. Use these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the chassis cover as shown in Figure 4-6.

( ) Install a 60-watt lamp in the lamp socket.

If you plan to use the Heathkit Garage Door Transmitter and Receiver with your Garage Door Operator Mechanism, the Receiver should be installed at this time. Refer to the instructions in the Manual supplied with the Transmitter and Receiver for installation instructions.

Your Garage Door Operator Mechanism is now adjusted and ready to use. To help you keep the Mechanism in good operating condition, read through the "Maintenance" section of the Manual. If the Mechanism fails to operate or if a problem arises, refer to the "In Case of Difficulty" section of the Manual.

OPERATING INFORMATION

Your Heathkit Garage Door Operator Mechanism is both simple and convenient to use. Just press the doorbell-type pushbutton switch and hold it in until you see the garage door start to move.

You may either open or close your garage door by actuating the Mechanism as just described. The pushbutton switch can also be pressed anytime the Mechanism is in operation to reverse the direction of door travel.

For more control of the Mechanism, you may use additional switches similar to the doorbell-type pushbutton switch supplied with this Kit. The additional switches may be placed at any location from which you wish to open or close the garage door. A length of 2-conductor cable should be connected from each additional switch to the 2-screw terminal strip on the Mechanism chassis assembly. One of the additional switches could be a key-type spring-return switch (SPST) located on the outside of your garage. This will provide another convenient and secure means of operating your garage door.

Each of the switches should be labeled prominently so that visistors will not mistake them for doorbell buttons.

REMOTE CONTROL

If you use the Heathkit Garage Door Transmitter and Receiver with your Garage Door Operator Mechanism, refer to the "Operation" section of the instruction manual supplied with them.

LAMP

The lamp on the Mechanism is turned on only when the garage door is fully open. A 60-watt lamp only should be used.

LOCKING THE GARAGE DOOR

The Mechanism, when properly installed, will lock the garage door closed. It is virtually impossible to open the door by hand from outside the garage. If for any reason you wish to open or close the garage door without using the Mechanism, simply grasp the rope (if used) attached to the quick-release pin and pull. The arm assembly will disconnect from the trolley and the door can be opened by hand. NOTE: If there is too much down pressure from the Mechanism, unplug the line cord, turn the large pulley a couple turns in the door-open direction. This will allow you to remove the quick-release pin easily.

SAFETY SWITCH

The safety (Automatic Reversing) switch in the chassis assembly will return the door to its fully open position should it be obstructed while closing.

POWER FAILURE

In case of an electric power failure, it will be necessary to disconnect the arm assembly from the trolley and open and close the door by hand until power service is restored.

MAINTENANCE

Very little maintenance will be required to keep your Garage Door Operator in good operating condition. The following points should be checked periodically.

MECHANISM

WARNING: The motor can be activated when making adjustments on the Mechanism. Always disconnect the line cord from the ac outlet before working on the Mechanism.

The chain should be lubricated by wiping it with a rag soaked lightly in oil.

After some use, one to three weeks, it may be necessary to tighten the chain and/or belt. Most chains and belts have a tendency to stretch when first placed in operation. If the chain on the Mechanism is allowed to sag below the beam, there is a good chance of the chain falling off the Mechanism or erratic operation of the Automatic Reversing switch. A belt that is too loose will allow the motor to turn without operating the Mechanism.

GARAGE DOOR

For continued good performance, it is important that the moving parts of the garage door be kept well lubricated as directed by the garage door manufacturer. This is especially important for the tracks of track-type doors.

IN CASE OF DIFFICULTY

Any problem that develops with your Garage Door Operator Mechanism should first be isolated to either the Transmitter, Receiver, or Mechanism, provided the optional Transmitter and Receiver are used. If they are not used, refer directly to the "General Troubleshooting Information."

To isolate a problem when the optional Transmitter and Receiver are used, press the doorbell-type pushbutton switch and proceed as follows:

a. If the Mechanism does not operate properly, the cause of the problem is in the Mechanism. First refer to the "General Troubleshooting Information," then, if necessary, refer to the "Troubleshooting Chart."

b. If the Mechanism operates properly, the cause of the problem is in the Transmitter or Receiver. Refer to the instruction manual supplied with the Transmitter and Receiver.

GENERAL TROUBLESHOOTING INFORMATION

1. Recheck the wiring. Trace each wire in colored pencil on the Pictorials as it is checked. It may be helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.

2. If, after careful checks, the problem is still not located, and a voltmeter is available, check the voltages against those shown on the Schematic on Page 47. A continuity check of the various components may also help to locate the problem.

3. A review of the "Circuit Description" on Page 46 and a study of the Schematic may also help you locate the difficulty in the Mechanism.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.

Troubleshooting Chart

DIFFICULTY	POSSIBLE CAUSE
Mechanism inoperative.	1. Line cord disconnected. 2. Circuit breaker. 3. 24 volt transformer. 4. Latching relay RL1. 5. Belt too loose.
Motor inoperative, buzzing sound coming from control head.	1. Door binding or accidentally locked. 2. Capacitor C1. 3. Latching relay RL1. 4. Chain too tight. 5. Pushbutton wires short circuited together.
Door does not reverse direction when meeting an obstruction.	1. Chain adjustment. 2. Coil spring adjustment. 3. Automatic reversing switch adjustment.
Door returns to open position during closing operation when pushbutton is released.	1. Chain adjustment. 2. Coil spring adjustment. 3. Automatic reversing switch. 4. Latching relay RL1. 5. Warped or binding door.
Light remains unlit when door is fully open.	1. Lamp burned out.
Motor continues to run after door is fully open.	1. Up-limit switch operator adjustment.
Motor continues to run after door is fully closed.	1. Down-limit switch operator adjustment. 2. Belt too loose.
Belt squeaks.	1. Lubricate with talcum powder or belt lubricant.
Motor turns backwards.	1. Motor or microswitches S1 and S2 wired incorrectly.

SPECIFICATIONS

Door Size and Type	Overhead residential garage doors up to 8' high.
Control	Wall-mounted, doorbell-type pushbutton switch, or optional devices (transmitter-receiver, key switch, etc.).
Maximum Door Opening or Closing Time	Approximately 9 seconds (on 7' high door).
Safety	Door travel reverses, returns to fully open position, and stops if obstructed while closing.
Overhead Mounting Clearance	2-1/2" above highest point of door travel.
Safety Lamp	60-watt lamp automatically turns on when the door is fully open.
Motor	120 Vac, 60 Hz, 1/4 horsepower, capacitor-run, 1500 rpm.
Power Requirements	120 Vac, 60 Hz, 660 watts (excluding lamp).
Dimensions	123" long x 10" high x 8-1/2" wide.
Net Weight	37 lbs.

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while reading this section will help you understand how the Garage Door Operator Mechanism works.

The Schematic Diagram shows all switches and the relay contacts in the position they would be in when the door is open, the motor not running and the lamp turned on.

To automatically open and close a garage door, it is necessary to use a mechanism that can start, stop, and reverse the direction of the drive motor. These functions are obtained by using a power circuit, a switching circuit, and a motor that has both forward and reverse windings. The power circuit supplies the necessary line voltage to operate the motor, while a 24-volt switching circuit controls the latching relay which directs power to the appropriate stop switch and motor winding.

Line voltage is applied to transformer T1, to the yellow (common) motor lead and to contact 3 of latching relay RL1. Circuit breaker CB1 provides overload protection for the motor and transformer.

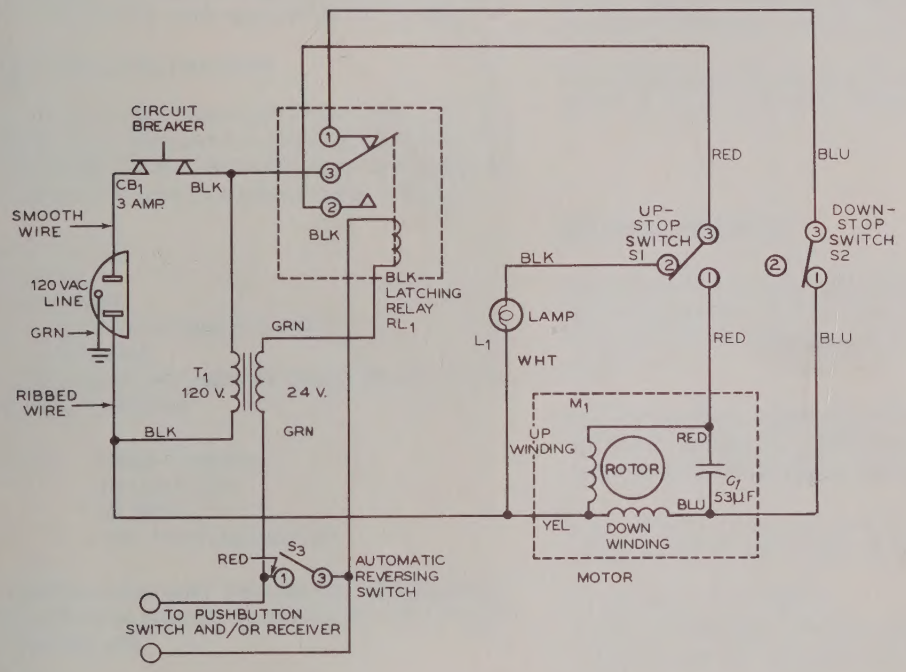
When the externally-mounted pushbutton switch is pressed, 24 volts is connected across the coil of relay RL1 and causes contacts 2 and 3 to close (opposite that shown in the Schematic). Power is then applied through contacts 1 and 3 of the down-stop switch and through the down winding of the motor. The motor will run until either the down-stop switch, the reversing switch, or the pushbutton is actuated. When the door reaches its closed position, contacts 1 and 3 of the down-stop switch will open and remove the power from the down-winding of the motor.

As soon as the door started in the down direction, the up-stop switch operator (mounted on the chain) moved off the actuator of the up-stop switch allowing contacts 1 and 3 of the switch to close. However, this does not affect the door travel as contacts 1 and 3 of the relay are open.

If an obstruction prevents the door from closing, the chain tightens and actuates the automatic reversing switch. With contacts 1 and 3 of the automatic reversing switch closed, 24 volts is connected across the winding of the relay, as would be the case if the pushbutton were pushed. This action causes the relay to latch in the position shown on the Schematic. Power is now coupled through contacts 1 and 3 of relay RL1, through contacts 1 and 3 of the up-stop switch, to the up winding of the motor. The motor will reverse and drive the Mechanism to open the door until the up-stop switch contacts are opened by the up-stop switch operator on the chain.

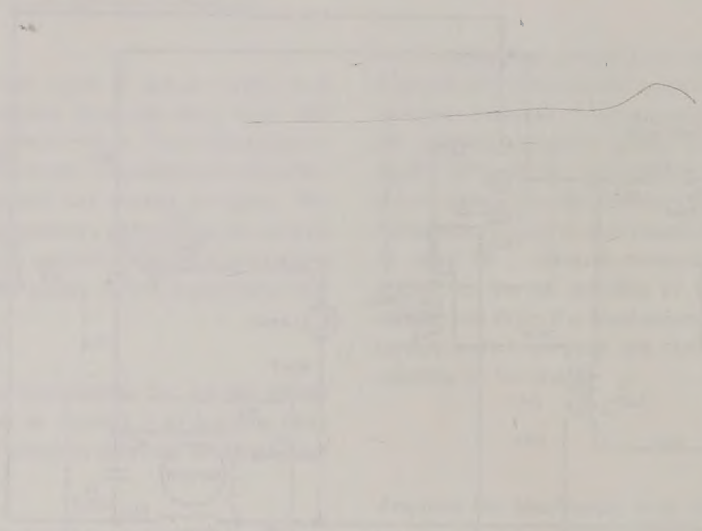
Anytime the Mechanism is in motion, the contacts of the up-stop and down-stop switches are closed. This allows the door to be reversed at any time by pressing the pushbutton switch. The direction the door will travel depends on the position of contact 3 (movable) of the relay.

When the door is fully open, power is applied to the lamp through contacts 3 and 1 of the latching relay and contacts 2 and 3 of the up-stop switch.



SCHEMATIC OF THE HEATHKIT® GARAGE DOOR OPERATOR MECHANISM MODEL GDA-309-1

NOTES:
1. THE SWITCH AND RELAY CONTACT POSITIONS ARE SHOWN FOR THE FOLLOWING CONDITIONS:
   GARAGE DOOR ..... FULLY OPENED
   LAMP..... ON.
2. ⏚ THIS SYMBOL INDICATES CHASSIS AND LINE CORD GROUND.



CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

Replacement parts are maintained specifically to repair Heath products. Parts sales for other reasons will be declined.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

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Benton Harbor, Michigan 49022

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